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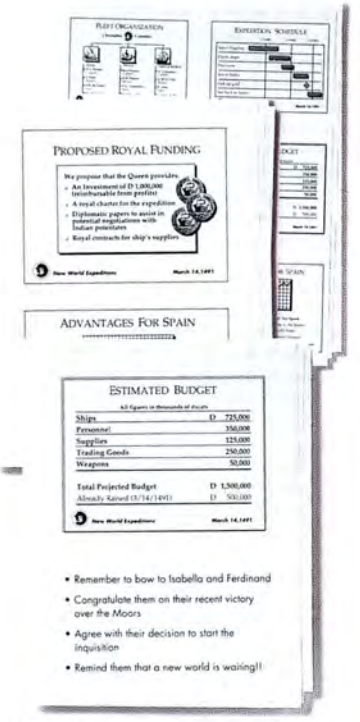
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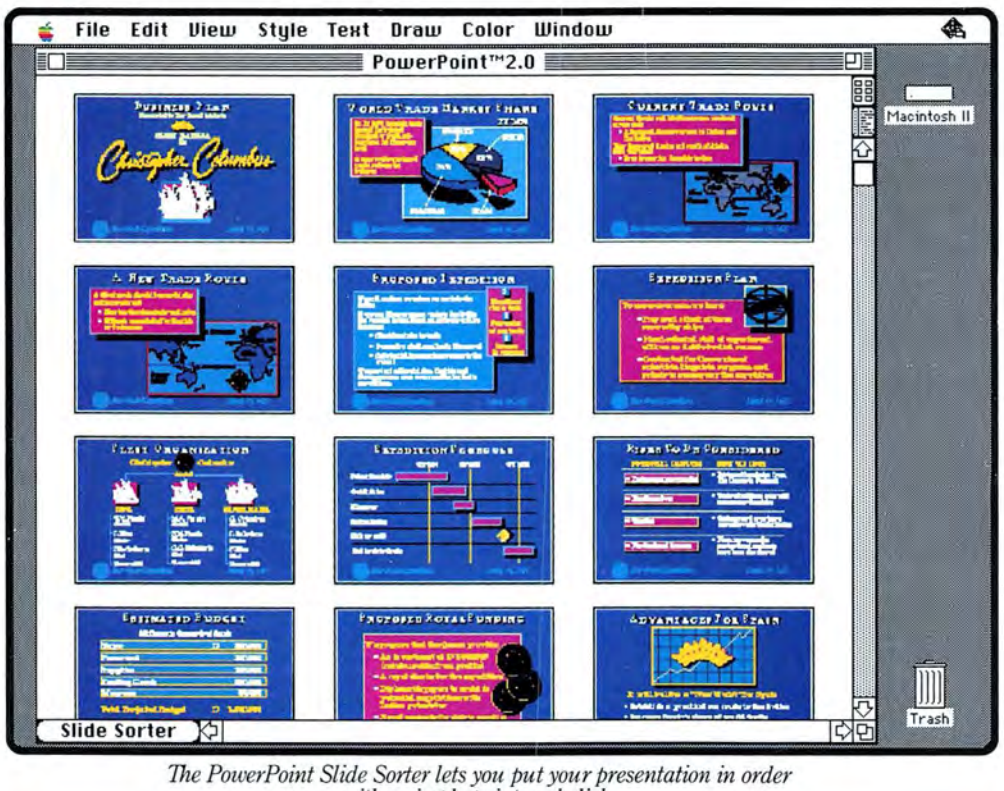
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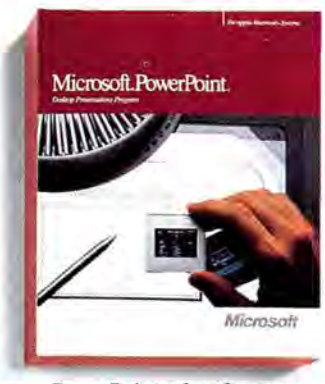
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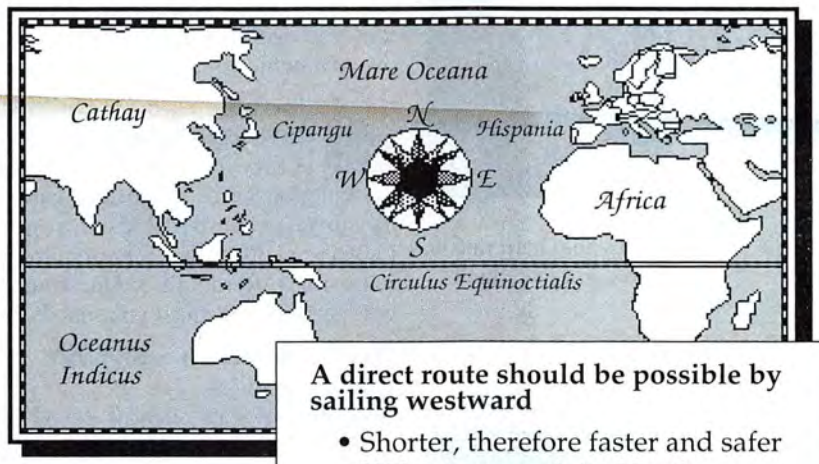


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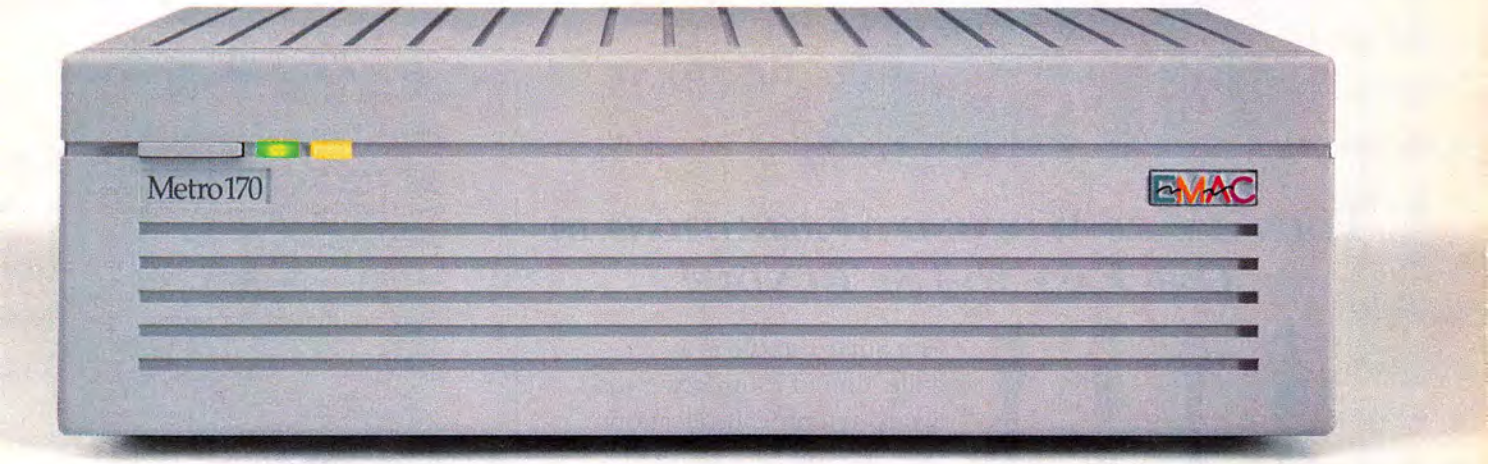
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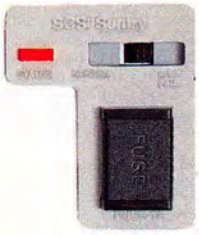
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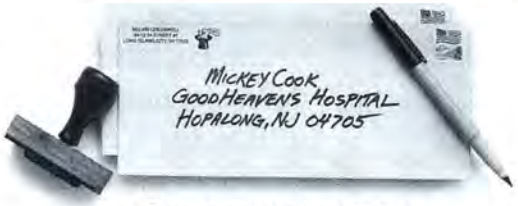
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About **MacUser**

From Film to Finder

Imagine getting more than 800 Mac products free — every year. Sounds good, right? Now imagine sifting through that pile and picking the top 20 percent to review. That's what senior editor Russ Ito has been doing for nearly three years. (For those keeping count, that means sorting through nearly 2,500 boxes.)

It takes a strange combination of interests and circumstances to take someone from six years in film school to more than three years at a computer magazine. For Russ, the interests included a fascination with technology, writing, and the media.



***MacUser* senior editor Russ Ito's wide-angle approach to the market has kept his arms overflowing with products.**

When Russ joined *MacUser* three years ago ("I really needed a steady job."), there were only five other editors on the staff. "It was a great experience, because it gave me a chance to see nearly every aspect of the business and it also forced me to keep as broad a view as possible. Technology moves so fast that if you focus your attention on just one area, you're likely to miss the developments and connections that are going to change your world right under your nose."

Russ' determination to hold the broad view made him a natural for our new-products coverage, a job that he's done for more than two and a half years. In fact, in that time, he's seen so many new programs and gadgets that now he isn't sure if he's seen more movies or more products ("I think movies are still ahead, but the gap's closing fast. Does seeing *Citizen Kane* and *The Road Warrior* a dozen times each count as 24?").

Even after more than three years on the job, Russ still maintains a wide-angle view of the market, and to help give you a similar perspective, we've brought back two sections from our past: New on the Menu and Quick Clicks. "New on the Menu was the first section I edited, so this is kind of déjà vu," he says. "But this time, we're going to do things a little differently. Although we'll still be covering all the interesting new products we've seen that month, I'll also be using the first page to provide some perspective — OK, *my* perspective — on the latest trends in both technology and products. Products may make us better workers, but perspective makes us better people." Quick Clicks, our short reviews, are an extension of New on the Menu and are there to help us broaden our range of product evaluations.

As for Russ' film interests, although multimedia hasn't supplanted them, it has become a significant point of interest. "Media integration is the future," he says. To open your eyes to the future, check out our Multimedia Encyclopedia in this issue. It's your chance to see where we're going and to catch up on where we've been.

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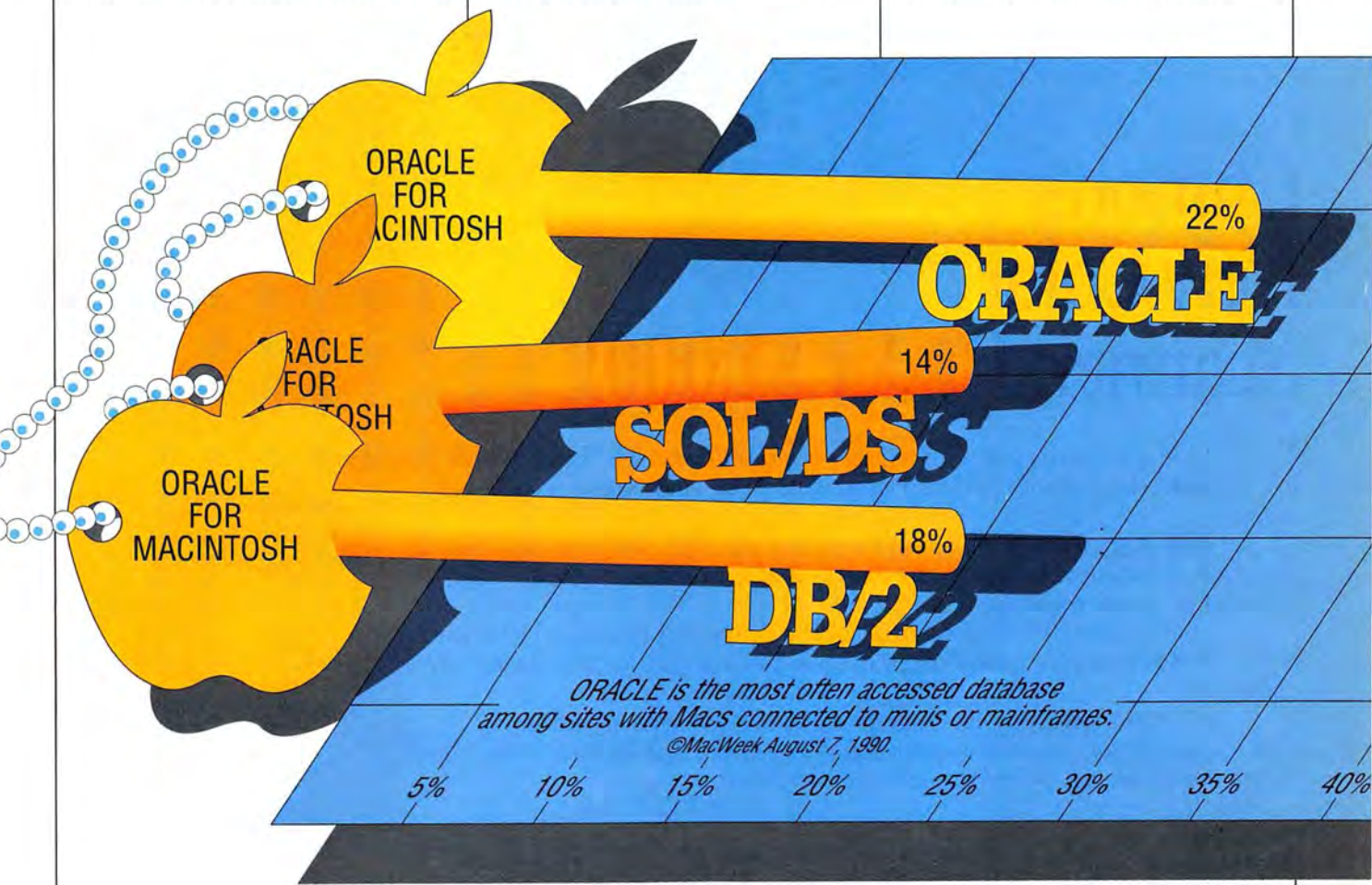
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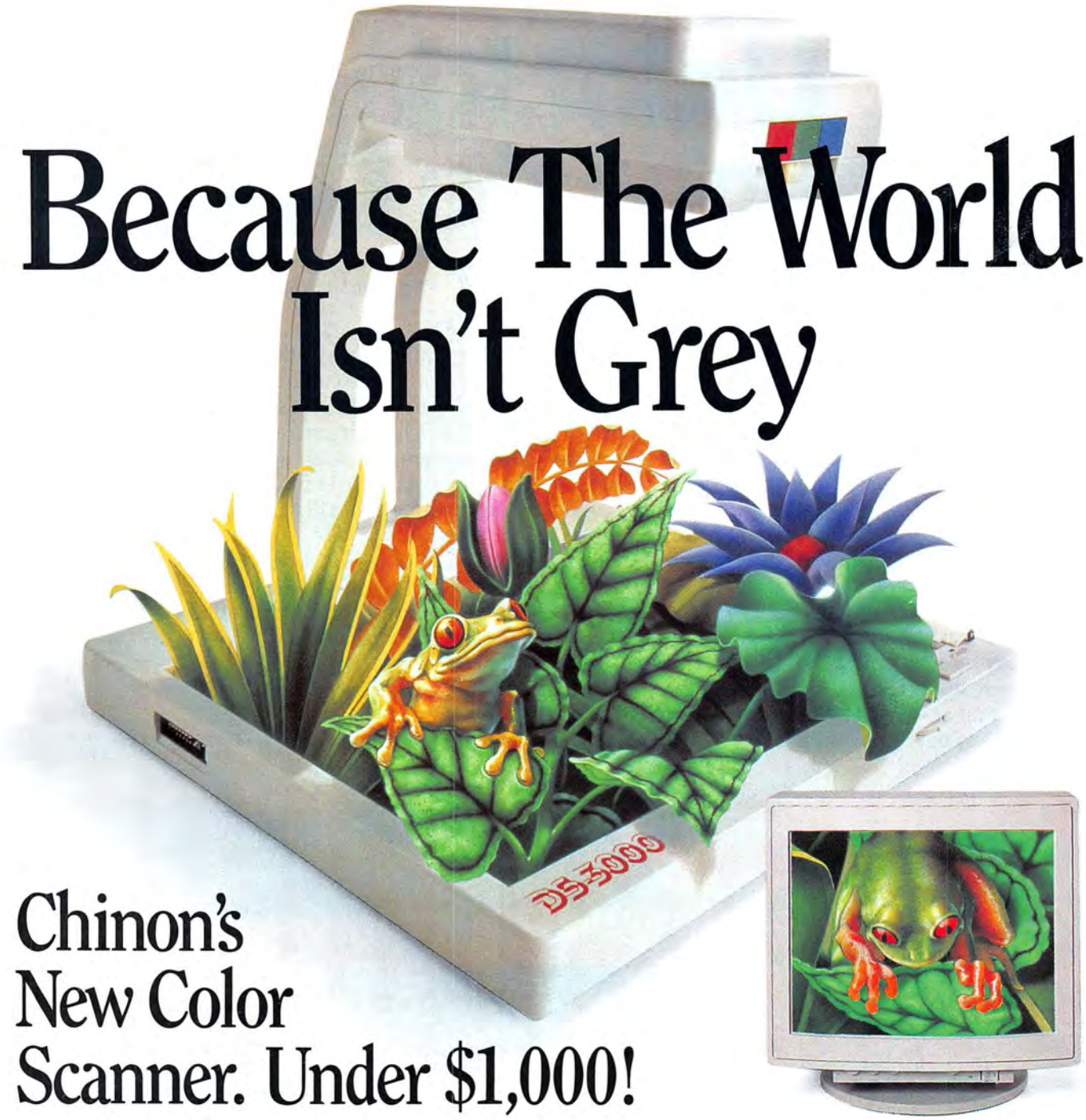
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LETTERS



Six months ago, reader Paul Quade, of Anaheim, California, purchased a new Mac SE. Imagine his surprise when he found a brochure advertising the new Mac Classic enclosed with his bill from Apple Credit. The brochure explained how the low-cost Classic could do everything his now discontinued SE did — for about $1,500 less. "It was probably the least intelligent thing I've ever seen any company do. Damn it! I still owe more for my Mac SE than Apple's selling *the Mac Classic for!"*

✉ *Write to Letters to the Editor, c/o* MacUser, *950 Tower Lane, 18th Floor, Foster City, CA 94404, or post your letter on the MacUser Forum of Zmac, our on-line service.*

All letters become the property of MacUser, *and we reserve the right to edit any letters we print. Please include a return address and a daytime phone number.*

New-Mac Flak

Earth to John Sculley. Earth to John Sculley. Come in, John. John, I think you've lost your mind. That new line of "low-cost" Macintoshes isn't low-cost, and the Macs are still more expensive than more-powerful Big Blue clones. If you're trying to carve out a larger chunk of the market, you need *really* low-cost machines. Try $700 tops for the Classic. Have you read a newspaper lately? How about this: a Turbo 386/SX, 1-megabyte/16 megahertz for $695. John, it's time to get back to reality. Have you watched someone using a PC with Windows? Kinda Mac-like, isn't it? Have you gone to the local software store and looked around? You'll probably find one or two shelves devoted to the Mac, one or two devoted to the Apple IIGS, and the rest of the store devoted to the PC. Doesn't that tell you something? Aren't you starting to feel like General Custer? It's just a matter of numbers — not enough of us and too many of them.

David O. Barkdoll

No address included

You might be able to get an IBM clone for $695, but you'll still have to shell out for Windows, a network card, a serial card, and a monitor (not to mention a card to run it) — all to get what comes with Apple's bottom-of-the-line Classic. As for the numbers, early indications are that the new Macs are selling as fast as Apple can make them. — JB

I know it's not polite to gripe when Apple finally introduces new products, but *come on.* Why did it do some of the things it did to the Classic? For instance:

- Why is it that if you want to add memory, you must first buy a special card to hold the chips?
- Why was the SE's expansion slot taken away and replaced by the new memory-expansion slot?
- Why is only 1 megabyte of memory installed? What happens when System 7.0 finally ships? Will Apple start selling Macs with 2 megabytes and screw those early buyers?
- Why no PMMU? Does this mean Apple doesn't intend the machines to support the virtual memory promised in System 7.0, or that virtual memory won't be in System 7.0, or that people will be forced to buy yet another add-on card?

Once again Apple provides more questions than answers.

P.S. I just read something very interesting: Apple plans to put the operating system in ROM in January 1991. What's up? I guess it always pays to wait when deciding about buying a Mac.

J. Carter Stiles

Mississippi State University

The operating system has *been built in to the Classic's ROM ever since the Classic started shipping back in October. To access it, hold*

Dear Mr. Sculley . . .

No sooner did we arrive at the product announcement of the new Macs last October than we checked the official T-shirt to see if Apple had adopted one of the wonderful **marketing slogans** suggested by our readers. Instead, we were underwhelmed by "Macintosh. More than you imagined for less than you think." In other words, "You probably don't expect a lot, but at least it doesn't cost as much as you're afraid it will."

When it comes to **sound on the Mac,** readers seem to think that Apple got it right for once. "I think it's neat, but Apple should hurry up and incorporate it into all the Macs, not just the LC and IIsi," says Mindy Robbins of Escondido, California. "Great for education," says Rob Cannon of Olney, Illinois. "Especially foreign languages. I can't wait until there's software that will really take advantage of this stuff."

Edward Reid wrote from Luxembourg, with several tongue-in-cheek reasons why it's absurd to believe that there are times when **the easy-to-use Mac is not so easy:** "The Mac's interface is so consistent: The pretty graphics allow apparently similar actions to actually mean the same thing. For example, dragging a file into a trash can has such a natural parallel in dragging a disk into a trash can.

"And we now have immediately obvious, meaningful, easy-to-remember commands such as Command-Option-X, instead of those awful English-derived things such as MOVE." (OK, but isn't it cheating to take examples from Microsoft Word?)

Not long after introducing its new Macs, Apple introduced another innovation: a toll-free customer-relations phone line ([800] 776-2333). It's not a technical support hot line, though. It's more of a last resort for the increasing number of customers who don't seem able to get satisfactory service from their dealers. But now that the door's already been opened a crack . . .

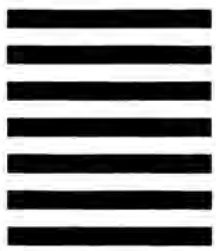
Speak Up: How should Apple provide direct support for its customers?

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down Control-Option-X-O when you turn on your machine. Your Classic will then boot from a ROM-based RAM disk called Boot Disk, which mounts on your desktop. It contains eight system files, but you can't add anything (DAs, cdevs, or INITs) to it. This feature is unannounced and undocumented, probably because Apple is not through with it yet.

The answer to the rest of your questions is that the Classic is a low-cost machine. You need a special RAM card because it's cheaper for Apple to have you buy one than it is to build four SIMM slots on the motherboard, which is now too small for SIMMs anyway. And Apple does sell a standard 2-megabyte configuration (with card). The expansion slot was removed because a large majority of SE owners don't use the slot anyway — those who need expansion tend to buy higher-end Macs. And the 68000 doesn't support a PMMU, so there's no point in including one.— JR

I saw Apple's new-product announcement live via satellite on cable TV. There were virtually no ethnic people in the presentations and demonstrations. On this basis alone, the program was outrageous, and this was a gross oversight by Apple. What the Apple program portrayed to me, a Caucasian-American who has supported the Macintosh even through times when I was a very poor graduate student making less than the ethnic people in housing projects down the road, is that Apple manufactures and markets the Macintosh to "white America" and to people of European origin, not caring or striving to bring in a broader ethnic base of users — the consumers. This base is at the heart of what the Macintosh represents.

Susanne Lomatch
Chicago, IL

Labor Pains

I fully agree with Thom Hogan's statement in "The Self-Supporting Mac" (October '90, page 263) that Apple doesn't ". . . have the foggiest notion of what support is really about." In my experience, this statement also fits some of Apple's authorized dealers.

About a month ago, I turned my computer on and the 40-megabyte internal hard disk refused to spin up. It had done this occasionally, ever since the computer was about four months old (I didn't get AppleCare).

When I remembered a news clip in *MacUser* about Apple's extending the warranty on some disk drives, I sent my wife to the dealer with our serial number to see if the drive was covered. The technician didn't know, so he called Apple. He soon returned and said that he couldn't get through because the number was busy. My wife then asked how much it would cost for another HD40 if we exchanged the defective one. Are you sitting down? He told her it would cost $3,000 — *plus* labor!

William Jones
Arlington, TX

Return of Jasmine

In January 1990, I tried to order a 100-megabyte hard-disk drive from Jasmine. I was told that the item would be placed on back order and that it would be shipped in three weeks. Six weeks later, I called again, only to find that the item had not been shipped. I canceled the order. In mid-March, my credit-card company was billed for the hard drive that was never shipped. Soon thereafter I received notification that Jasmine Technologies had filed for bankruptcy. I have never received the hard-disk drive that I was charged for.

I see now that Jasmine is advertising again in your magazine.

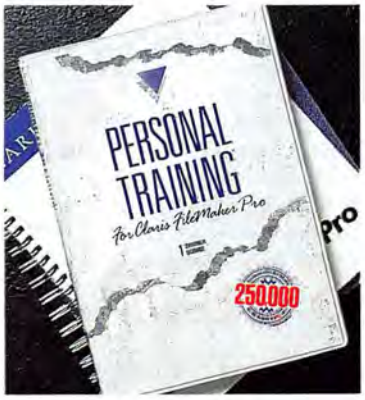
As a subscriber of four years, I believe that I am entitled to at least a simple answer to a fairly simple question. I believe that it is fair to assume that I am not the only individual who was cheated by Jasmine Technologies. How low can an advertiser sink and still be acceptable to *MacUser?* In my opinion, Jasmine's business practices are unacceptable, and therefore promoting Jasmine products by accepting its advertising dollars is also unacceptable.

Douglas W. McKibbin, M.D.
Waynesboro, VA

Technically, the Jasmine Technologies that currently advertises in MacUser *and other publications is a subsidiary of the French computer company Chess S.A. — it is not the same company that failed to deliver products to you and others. Small solace, we know. The good news is that a percentage of the new Jasmine's profits is earmarked toward reimbursing the old Jasmine's creditors (yourself included) over the next five years — with interest. If you have other questions about the Jasmine bankruptcy, you should contact the U.S. Bankruptcy Court for the Northern District of California in San Francisco at (415) 556-2250. — JB*

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LETTERS

Monitoring Microsoft

Upon receiving my copy of the December '90 issue, I was struck by the fold-out Microsoft ad inside the front cover. The picture shows an office full of people at identical desks, each with some kind of Mac. Of some 28 discernible employees, 10 of 16 (62.5 percent) of the men are using large-screen Macs, compared with only 2 of 12 (16.67 percent) of the women. That's a glaringly disproportionate ratio, wouldn't you say? I can anticipate this being dismissed as merely coincidental, but you know the proverb about a picture being worth a thousand words. Until we all wake up to what we are unintentionally doing, we have little chance of changing.

William Kuentzel
Salt Lake City, UT

True Blue

Thanks to Robert R. Wiggins for one of the best nonbiased comparisons of the Mac environment and DOS/Windows 3.0 that I've seen in a Mac publication (October '90, page 29). As both a Mac and PC user (yes, I prefer the PC because I'd rather not be mouse-bound and I'm comfortable with commands and programming), I feel it's pointless to compare two completely different media on two different platforms.

People who want an informed opinion on Macs versus PCs can only benefit from Wiggins' analysis of the computer industry. Hopefully, the Windows/Macintosh rivalry will cause both Microsoft and Apple to provide innovative and affordable products for all computer users.

Anita Prather
Atlanta, GA

Terabyte Blues

We read with great interest John Rizzo's piece on erasable optical drives (November '90, page 102). In just the past few years, we've seen our customers' online-storage requirements swell from hundreds of megabytes to dozens of gigabytes, so erasable optical drives and similar technology can't come fast enough for us. Given the advancing state of both erasable and WORM storage, however, your suggestion in the sidebar on page 104 for the unit of measure *LOC* (for Library of Congress) might be premature. As described, the LOC works out to 9.5 terabytes (190 digital optical tapes—at 50 gigabytes each). That's a lot, but given that it will take 105 LOCs to make 1 brontobyte (1,000,000,000 megabytes—also known by its less robust name, petabyte), with exabytes (1,000 brontos) waiting just around the corner, you might want to wait before assigning the Library of Congress' name to a unit of measure. The huge appetite for storage, especially from byte-hungry GISs (geographic information systems) and similar imagery/graphic areas, could make the proposed LOC seem like an insignificant number.

George Barton
Rick Kercz
Dennis Bowden
Huntingtown, MD

A Killer Mouse and Cord

The December issue of *MacUser*, on page 172, recommends *The Little Mac Book* by Robin Williams. I have both of her books, and they're great, but there is a big problem on page 92 of her *Little Mac Book*.

She offers the following solution for a frozen screen: "Try unplugging the mouse and/or the keyboard for a minute or two; plug it back in and the screen sometimes unfreezes. If that doesn't work, then you just have to turn the machine off."

In "6 Ways to Fry Your Mac," (September '90, page 311), John Rizzo points out as his number-1 way to fry your Mac: "Plugging in or unplugging a mouse or keyboard with the Mac turned on. If you do this, you run the risk of frying the ADB (Apple Desktop Bus) chip on the motherboard, which results in a dead keyboard and mouse" (and a large repair bill, I might add).

This is the only major problem I've found with her book. Otherwise, it is a fine small book on the basics of Macintosh computing.

Ray Zoller
San Antonio, TX

Ricoh Rebuttal

Regarding Owen Linzmayer's review of the Microtech R50 removable hard drive (December '90, page 71), I find his arguments unpersuasive. He says that SyQuest has 70 percent of the removable-media market. What about Bernoulli's claims of a much larger base?

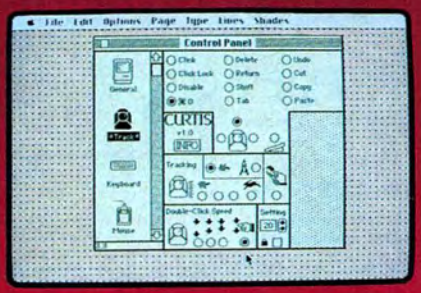
The marginal slowness that he detected when comparing the R50 with the SyQuest R45 is insignificant in light of my experience with the enormous "handle with care" treatment that SyQuest cartridges require. Microtech's Ricoh cartridges are sturdy and self-contained and don't need to be carefully pocketed into plastic cases as

This is not your average mouse...

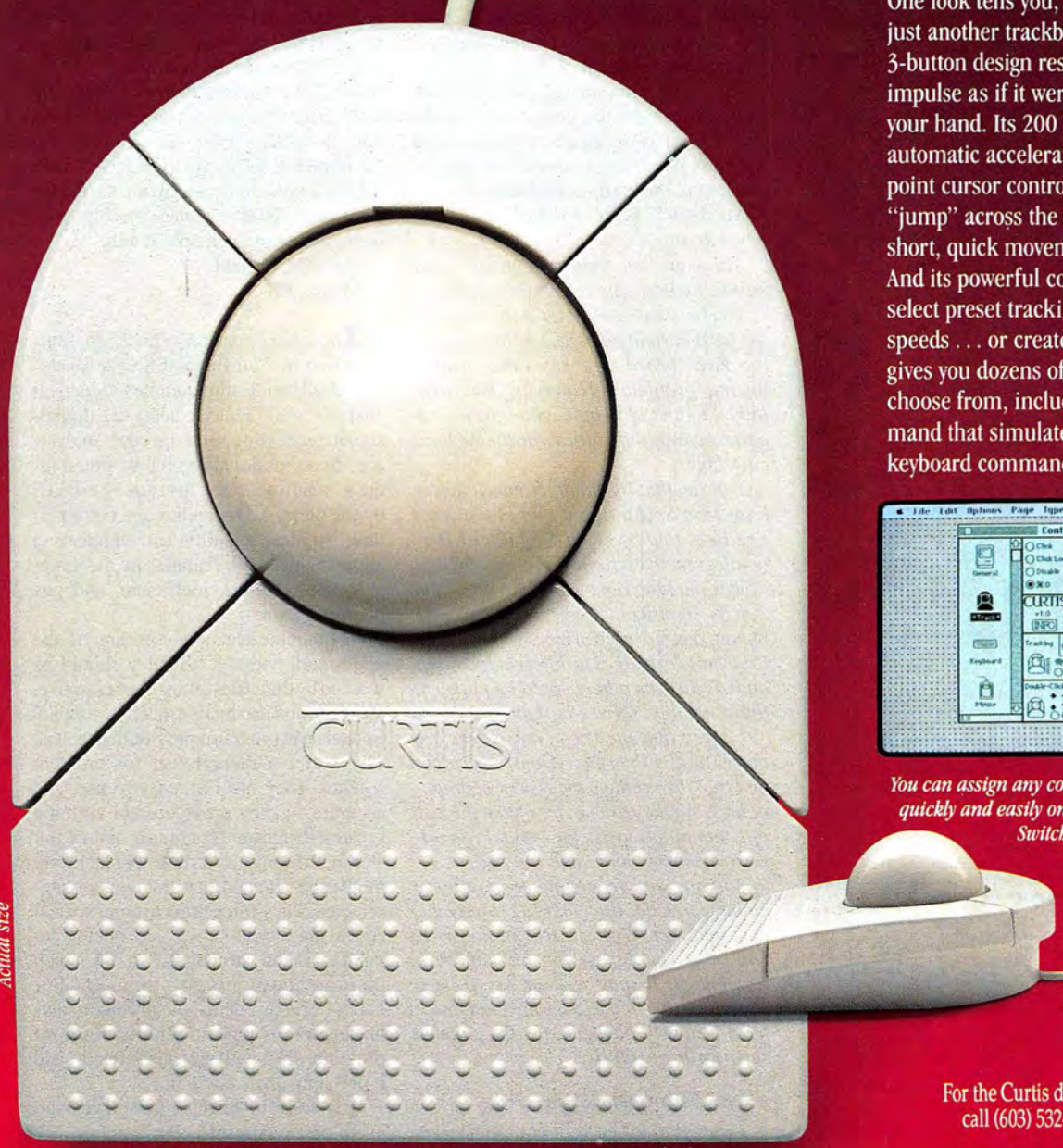
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soon as they're removed from the drive. So what Linzmayer sees as a negative (they don't come with plastic cases), I see as a positive.

The Ricoh cartridges are much sturdier than the SyQuest ones and have a reduced risk of contamination. That's because the Ricoh drive, as Linzmayer points out, has an airtight design with a built-in filter to prevent particle contamination.

Unlike the SyQuest drive, both the Ricoh drive and the cartridge are shockproof and the shutter on the cartridge can't be opened except when it's inserted. Thus the statistical probability of contamination is much lower for Ricoh than for SyQuest.

As for the extra money, reliability is a key factor in hard-disk storage, and I would bet that in time Ricoh will overtake SyQuest. It's not as expensive as Bernoulli and has all the hard-disk advantages.

Matthew L. Lamb 75126,37
via Zmac

Although you bring up many good points, I stick to my review as published.

You say you've had a lot of trouble with SyQuest cartridges, and I believe you. I too have heard of many other people having problems. However, I've also talked to lots of people who haven't experienced any difficulties with the SyQuest cartridges.

You say that Bernoulli claims a larger base than SyQuest, but that is not what I've been told by either SyQuest or Bernoulli executives. Both agree that SyQuest "owns the Mac removable market." And that is significant if the reason you're buying a removable drive is to be able to transport cartridges to different locations and use them on other people's equipment (most notably, service bureaus').

I agree that the Ricoh cartridges are much sturdier than the SyQuest cartridges and that they reduce the risk of contamination, but they are not free from the risk of contamination, as the company's advertisements would have you believe.

You say you're willing to pay more money for reliability, and I certainly understand that. With the Ricoh, however, you're paying extra for an unproven technology. It may well prove to be a superior drive in the long run, but I find it hard to justify paying extra for claimed superiority. — OWL

The Eigen Sanction

I was glad to see your comprehensive article on number-crunching programs ("On Beyond Spreadsheets," November '90, page 148). However, you let a very important program — MatLab by MathWorks — fall between the cracks.

MatLab falls into neither of the categories you explored but is somewhere in the middle ground. It lets users perform mathematical tasks, similar to the way Mathematica does in Numerical mode, but it does so much more efficiently. MatLab is based on a proprietary language that executes matrix operations expressed on the command line as you would write them on paper. Typically, users compose procedures and functions in the program that would otherwise take pages of FORTRAN code to accomplish.

MatLab performs many of the same tasks as the programs you reviewed but does so totally under user control. An environment similar to FORTRAN with IMSL, it's much simpler to use. It's not for everybody, but it occupies an important niche in the research community.

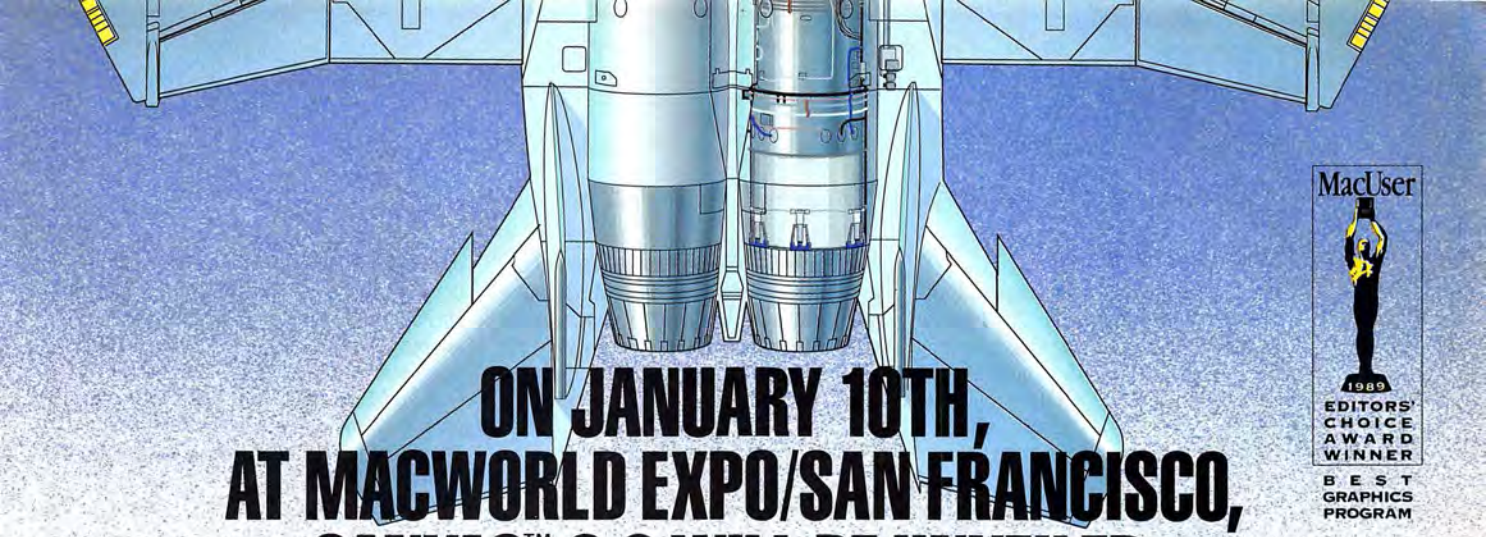
David B. Enfield
Miami, FL

Those huge, expensive math programs reviewed in "On Beyond Spreadsheets" do indeed handle ultracomplex numerical analysis well. Fourier analysis, digital-signal processing, and spectral analysis are often (but not always) best suited for these "math monsters." But don't be fooled by the pretty 3-D graphics and color pictures. In most scientific and engineering applications, these features are meaningless, unproductive, inefficient, and just plain confusing.

Most numerical analyses are of the nonesoteric variety, and they should be worked by the easiest, most cost-effective, efficient, and productive means available. Spreadsheet programs provide that means. They offer a natural feel for problem solving. They are fast, easy to use, and accurate — they provide users with the greatest insight and continuity of thought. The math monsters, on the other hand, are more code-oriented than problem-solving-oriented. They force users to enter special codes, obey syntax rules, and operate leviathan menu structures, all of which disrupt continuity of thought. For nonesoteric problems, the problem-solving process is quicker with spreadsheet programs than with any other means, and it probably always will be.

It is folly to dismiss the power and usefulness of spreadsheets.

Bruce Acker
Tarzana, CA



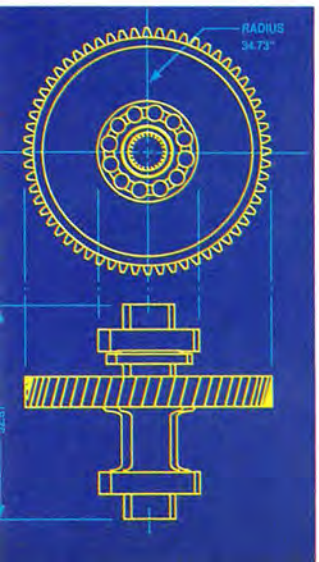
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Whiners and Users

I'm sick of all the public moaning about the delays of Apple's System 7.0. I get the idea that people are refusing to get anything accomplished on their Macs until it's out. I can't think of a single other consumer product for which updates are regularly available, especially at no cost. Do automobile manufacturers offer you a chance to swap engines when they redesign the model you own? Do you receive the latest revision to guidebooks and review publications without having to buy the new version outright? Hell, no. Is your current System 6.0*x* so archaic that you're unable to produce the perfect spreadsheet you've always dreamed of? Is it not to your advantage that Apple isn't willing to give you an incomplete product? Quit complaining, and get some work done!

Scott Palamar
Topanga, CA

OK, I've had it with all these computer users complaining about how they don't have enough memory and need faster computers, and easier use of their equipment! When is it going to end? Will they ever be happy? How greedy are these people, anyway?

Someone should take their computers away for a day and make them go back to the days of cutting, pasting, and using clunky old typewriters. Impossible, they say? Try it — then maybe we wouldn't have so many whiny people out there taking their computers for granted!

Stop complaining, and be thankful you have a computer!

Tammy A. Souder
St. Paul, MN

Read on to see how profoundly Amy L. Davis' life was changed when she finally got her priorities straight. — JB

A Mac Made in Heaven

I was crying to a girlfriend about how much I want to get married. "What does a girl have to do to get a husband?" I was pitiful.

My girlfriend said to me, "Amy, picture this: Mr. Right is outside your door. Next to him is a hooded phantom. You can have Mr. Right as soon as you hand over your Mac to the hooded phantom."

She then went for the throat and said, "And you can never buy another one."

I said, "Well, what if I get a Mac as a wedding gift?"

She said, "You'd have to return it."

Talk about a hypothetical situation helping to put things in perspective! Of course, it was no contest. I get more pleasure and work from my Mac than I've ever gotten from any man I've dated. And my Mac has never stood me up.

My first question is, Do you think I could turn in the man I'm currently dating for a laser printer? My second question is, Do you think Dear Abby would recommend that I go to a qualified therapist?

Amy L. Davis
DeKalb, IL

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When we consulted our *Abby (senior editor Aileen Abernathy), she said, "Hold out for a laser printer* and *a color scanner." — JB*

Hit Men

One reason why *MacUser* has become my favorite computer magazine is that it features two light-hearted and provocative columnists: Guy Kawasaki and John Dvorak.

I don't always think that what Kawasaki and Dvorak intend as funny is actually funny, and I don't always agree with them. But then, I'd be surprised to find all of anyone's stuff funny, and if I agreed with everything they said, then I couldn't fairly call them "provocative." Anyway, I thought you should hear a strong pro vote.

I particularly liked Dvorak's "Weenie Computers" (November '90, page 348) and Kawasaki's "Squeezing the Chairman" (November '90, page 47). I also liked Guy's "It's a Window-ful Life" (September '90, page 33).

John and Guy: Keep up the good work — whatever you decide that is.

David Gillap
Toronto, Ontario
Canada

D-d-d-vorak

John Dvorak's column "Five More Years of Griping" (December '90, page 402) refers to John Sculley as having "reverted to a pathetic childhood stutter" when Apple stumbled in '86. I suppose and hope Dvorak will always be Dvorak — misrepresentation straining for iconoclasm — but I wish his Word Tools had flagged that offensive usage.

My dictionary defines *pathetic* as "exciting pity or sympathetic sadness." Dvorak's remark seemed less benign. Years ago a documentary depicted stuttering as the result of excessive feedback between voice output (speech) and input (hearing one's own voice). The documentary showed a stutterer who improved greatly just by placing a device into his ear that jammed the sound of his voice.

In other words, stuttering is the result of neural overload, not personal flaw. Any sympathy should be for the endless abuse young stutterers suffer from their peers and older stutterers suffer from "jovial, carefree" columnists.

Ken Tilton
New York, NY

Clarification

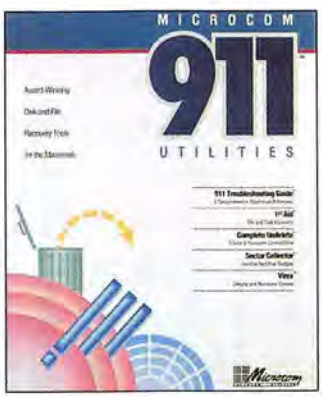
KidPix Professional, mentioned on page 168 of the December '90 issue, has been acquired by Brøderbund Software. Renamed Kid Pix, it will ship during the first quarter of this year. For more information, contact Brøderbund Software, 14 Paul Drive, San Rafael, California 94903; (800) 521-6263.

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Kristin Kozlowski, National Account Manager for a Fortune 500 Company

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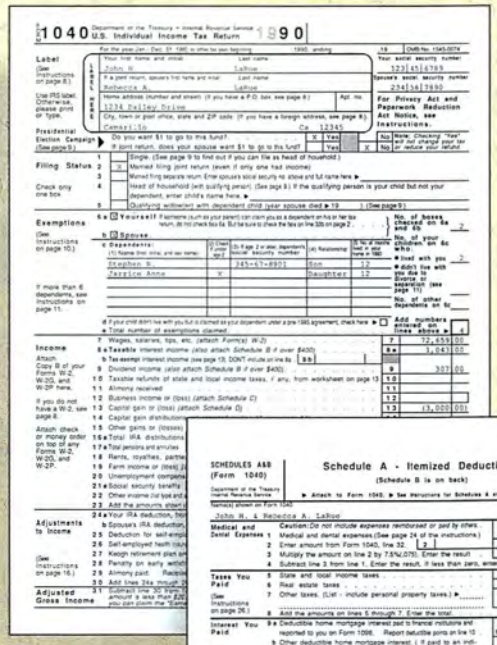
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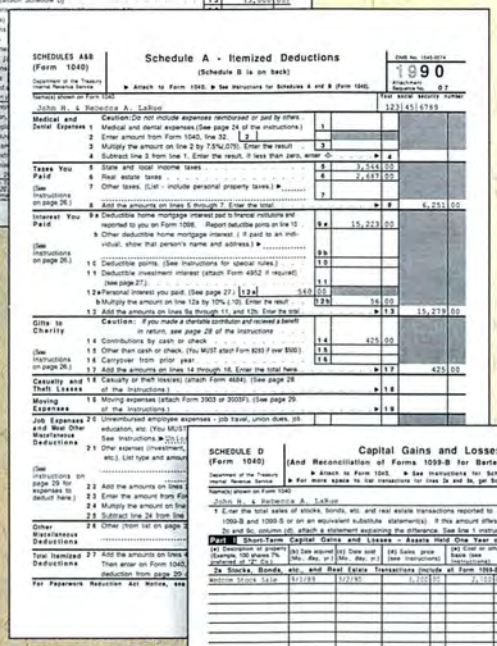
MacInTax has more forms than I could ever use. All just a mouse click away. When I needed to itemize, I used its built-in itemizing capabilities. It seemed like every time I needed some feature, it was right there. MacInTax made even the most complicated part of my taxes seem simple. I know why MacInTax has won so many awards. It's just the greatest program. Everyone should buy a Macintosh just so they can use MacInTax."

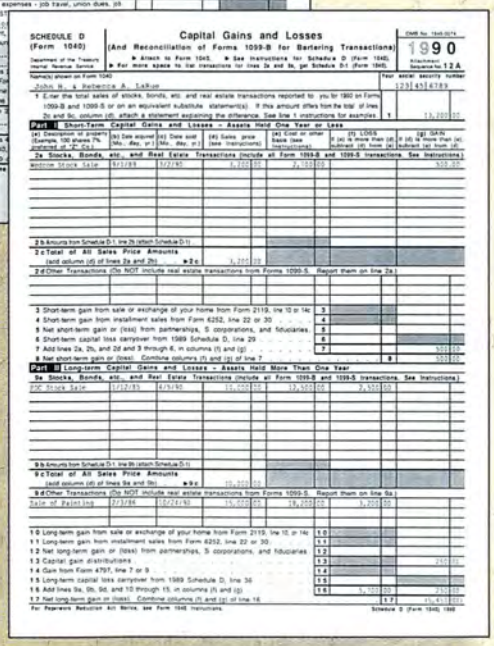
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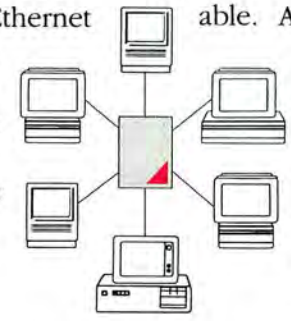


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JON ZILBER

LANs, LONs, and Gamelans



Will Mr. Coffee someday be just another Macintosh peripheral? It could happen — and sooner than you think, as Apple explores technologies to merge desktop computers with consumer electronics.

Last month's cover story about networking gave you an inside look at what we've been doing with our new NetWorkShop (a.k.a. Club Net) testing facility for connectivity products. We left off a couple of things, though. For one, it's not easy. For another, it's not so easy.

You know the Club Med slogan, "The antidote for civilization"? Our slogan for Club Net is "The antidote for antidotes."

There are countless solutions for virtually every connectivity problem. Unfortunately, these solutions — the antidotes for your connectivity woes — have a knack for becoming the basis for the next problem.

The antidote for all these antidotes is a universal Macintosh network that offers seamless, transparent standards for moving information around the net. But it doesn't exist. Yet.

The Paper Chase

The ideal model for computer protocols is paper. Paper is a standard communications medium that works. It comes in infinite varieties to fit every budget, every taste, every need. It supports all languages. It's easy to access, easy to create, easy for the creator or recipient to edit, easy to destroy, easy to archive. Related technologies for duplicating, scaling, and distributing it are ever present. It's appropriate for both broadcasting (high-volume printed matter aimed at a mass audience) and narrowcasting (individually written messages for an audience of one).

In the electronic realm, the closest thing to a universal standard is the MIDI interface that has become ubiquitous for all electronic musical instruments. You can buy virtually any MIDI synthesizer with full confidence that it will connect to all your other MIDI gear as well as to any computer equipped with a MIDI interface. But for general-purpose computing, reality is a lot more complex.

Now that the Mac has succeeded in Apple's goal of becoming the "second standard" of computing, Mac users no longer need to fight the competition. In fact, their success often depends on how well they can cooperate with users of other platforms. Mainframe-database access, file transfer, on-line connection, and all the other network-related tools of peaceful coexistence are the key.

Apple is leading the industry by replacing its pro-Mac zealotry-bordering-on-bigotry with a more tolerant attitude of *glasnost*. The situation parallels the coming shift in the global balance of power that centers around Eastern Europe's fragmentation and entry into the free market and Western Europe's impending economic unification in 1992. While the old guard — the U. S. — blithely proceeds with business as usual, the new guard — Japan, other Pacific Rim nations, and the progressive countries within both Eastern and Western Europe — are already planning for a new world economy. To do business with the U. S., outsiders must learn our language and conduct business on our terms — in other words, it's a lot like doing business with IBM. Meanwhile, virtually all other industrialized countries are already learning the diverse skills necessary for global communication and commerce. And that's the strategy Apple is taking.

Another company pursuing the universal global network is a startup called Echelon. Founded by Mike Markkula (one of the founders of Apple) and entrepreneur Ken Oshman — with financial backing from Apple, among others — Echelon is marketing the concept of the LON (local-operating network).

Echelon plans to push its LonWorks communications protocol beyond computer LANs (local-area networks) to connect everything from factory equipment to consumer electronics to the mobile network of electronics inside automobiles. Sounds a bit like Ted Nelson, the Cassandra of the computer industry, who has been pushing for a universal data standard (which he calls Xanadu) for almost three decades, without success (so far). But the portfolio of strategic partners that Echelon has amassed may give it the edge it needs to succeed.

When the Chips Are Tao

Apple is also investing in a chip-design company called Advanced RISC Machines Ltd. Although Apple hasn't said what kind of advanced RISC machines it will build around Advanced RISC Machines' chips, similar chips have been used for everything from workstation CPUs to controllers for microwave ovens.

The announcement came on the heels of Intel's media blitz for Micro 2000, the successor to the '286, '386, and '486 family of chips at the heart of all PC-compatible computers. In addition to a big boost in raw computing horsepower, Micro 2000 will feature integrated multimedia capabilities, multitasking, and speech input and output.

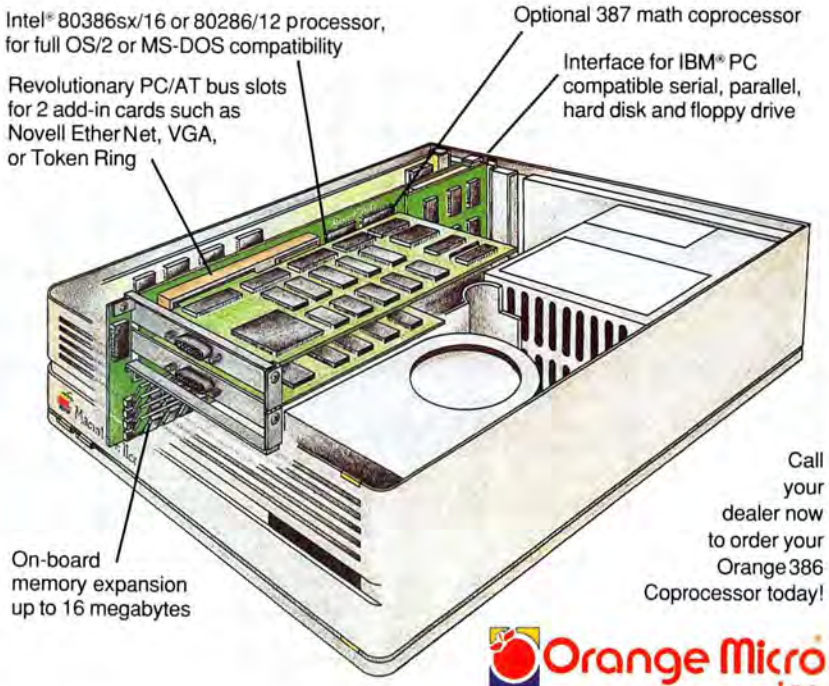
Why should you care where the chips fall? Well, although all these new technologies won't

completely determine the fate of desktop computers in the years to come, they do strongly restrict their direction by imposing an upper limit on what the operating systems and application-software packages of the future will be able to do. The chips are a bit like the Eastern concept of the *tao*, or the "way" of the universe; they provide a deep infrastructure that all the hardware and software creators must acknowledge and embrace if they have any hope of achieving nirvana.

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From LAN to Gamelan

There's another vision of the future of computers working in concert, and it also conjures up images from another corner of the globe — namely, from the Balinese concept of the gamelan. A gamelan, according to the *American Heritage Dictionary*, is "a type of orchestra common to Southeast Asia, consisting mainly of tuned metal or wooden chimes and other percussion instruments." But the members of a gamelan might put it differently: The gamelan *is* the instrument. By itself, each performer and each sound source is just a voice in the wilderness. Working together, they create something worth hearing.

In the gamelan model of computing, individual computers, applications, and operating systems will become meaningless. For any given task, a user will call on all the elements in his gameLAN to work together to coordinate all the elements in his information orchestra. Automatically.

At least, that's what Microsoft's Bill Gates is planning for. In his keynote address at last fall's Comdex trade show, Gates outlined a world of "information at your fingertips." In Gates' vision, the age of choosing an operating system; selecting from a library of applications; and then, finally, creating a file of useful data is about to be stood on its head.

In the future, you'll start with your data. A file will no longer be formatted as the offspring of a particular piece of application software. Rather, a file will comprise bits and pieces that invoke a variety of applications when needed. For example, suppose a page layout contains a pie chart and text. When you want to edit the chart, just click on it and — instead of relying on the charting capabilities of the page-layout application — call up the full-fledged charting program of your choice. Click on the text, and it calls up your word processor, not just the word-processing module within the page-layout program. If the text is in outline form, it calls up an outliner; when you type in numbers, a spreadsheet program, statistics program, or other appropriate number cruncher is at your disposal.

The Waiting Game

When it comes to computers, the future is always sooner than we think — but later than we'd like. Fortunately, there's plenty of innovation coming to keep you going until the global infotopia becomes a reality. This month's cover story on multimedia is a good place to start — to get a jump on 21st-century technology today.



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ROBERT WIGGINS

Support Woes



Calling all software publishers: Make sure your technical-assistance phone service has enough phone lines, live humans, and voice-mail options, and your customers will thank you for your support.

If your company is big enough, or rich enough, or smart enough to have a central Mac support group, count your lucky stars. Sure, support may not always have the answer. Sometimes they can't even figure out what your problem is. Or they make you use Word (or other "approved" software) when you want to use WriteNow. But they shield you from something you don't ever want to deal with if you can avoid it: vendor customer support. If you are lucky enough to have an internal group to turn to, here are a few of the things you are missing.

Trying to Connect

You don't know what frustration is until you've spent an afternoon trying to get someone on the phone to help you. There's the perpetual busy signal and, even more frustrating, the infinite hold (especially when they play annoying music — or, even worse, company ads — while the long-distance charges pile up). For a really fun time, call Apple and try to get help. This is less fun now that Apple has actually created a customer-support group, but it can still be a memorable experience.

You can reduce the likelihood of encountering some of these problems by checking your time zones. Don't call vendors during their lunch hour. Try to call during off-hours. Some support lines are open — and less busy — after normal business hours, and phone rates are lower too.

Use the intervening time to scrutinize the manual. You'd be amazed how many support calls are unnecessary because the answer is in the manual. Realize that right after a major upgrade or new-product release, customer-support phone lines are swamped.

Callbacks That Never Come

So you do finally get through the busy signals and off hold and get to speak to a human being — or, if you're not so lucky, to an answering machine. You leave your name and number and maybe even a brief description of the problem. Then you get on with your life. Three days later, when you finally receive a return call, you're either so frustrated from three days of problems that you're ready to explode or you've forgotten the chain of events that caused the problem in the first place.

There's little you can do to make callbacks come faster, but you can be ready when they do come: Take notes so you can give customer support as much information as possible. Write down what you were doing when the problem occurred. Try to reproduce the problem. Have your configuration handy, including information on software such as Control Panel documents. Freeware programs such as James K. Miles' Mug Shot can help you compile such information.

Voice Mail from Hell

One of the primary examples of technology's reducing the quality of life is voice-mail systems run amok. It's fantastic to be able to leave a message for a particular person, and it's certainly convenient to target calls when a support line transparently feeds into many support lines for many products. But getting trapped in a voice-mail system can be a nightmare.

Again, there's not much you can do except complain if a voice-mail system causes you problems — assuming you are able to maneuver to a point where you can actually leave a message for someone.

The Paid-Support System

This particular wrinkle has been around as long as there's been software, but it's growing more popular among vendors. It usually works this way: You get, say, 90 days of free support, beginning when you register your purchase (to thwart freeloaders trying to get support for pirated software). After your warranty has expired, additional support is available at a price. Sometimes updates and upgrades are included in the paid-support plan, so you may have to subscribe to keep current (or pay much heftier upgrade fees).

Quark was one of the first major vendors to institute paid support, and the company took a lot of heat for it, but it's becoming increasingly common.

This is another support woe you really don't have any control over. Your best bet is to get your company to pay the support charges, but if it won't or it's your personal software, then you have to weigh the pros and cons of buying support.

The Stealth Update

This is a new phenomenon, with Microsoft its largest practitioner. It works this way: A company produces a new program version that fixes a few rare, yet major, bugs. Only it doesn't tell anyone of its existence. If you call

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ROBERT WIGGINS

Let vendors with both good and poor support know that you're voting with your wallet and your brand recommendations.

the support line and report one of the bugs, the company sends you the update. But if you don't call, you never find out that there *is* a new version.

Yet again, there's not much you can do about this. You can be sure to report every little bug you find, in hopes of finding the miracle cure. You can also keep current through the on-line services, BBSs, and user groups, where people often share news of new versions.

Supporting Good Support

So now you know why you should count your blessings if you have a central support group. (Of course, if your central support group exhibits any of the problems described here, send it a copy of this column.) Some vendors do offer outstanding support, but even the best sometimes stumble into one of the problem areas.

Really progressive vendors are trying out new ways to support their users, such as providing support via on-line services such as CompuServe, GEnie, and America Online. These new kinds of support services help you avoid some of the aforementioned pitfalls and make getting help a lot easier.

Patronize vendors that do it right. Look for the ones that have plenty of support lines backing up that support number, plenty of support people to handle most calls, and a priority system that favors those callers who have waited longest and/or whose needs are the most desperate. Look for voice-mail systems that give you plenty of access routes to human beings.

Let vendors with both good and poor support know that you're voting with your wallet and your brand recommendations. After all, alternative products are available for most applications. Most vendors realize that one angry letter from a customer represents many, many angry customers who didn't bother to write. By voicing your dissatisfaction with product support, you have nothing to lose but your waits.



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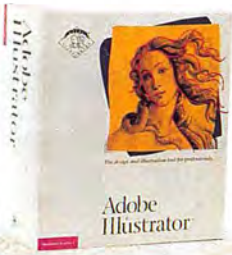
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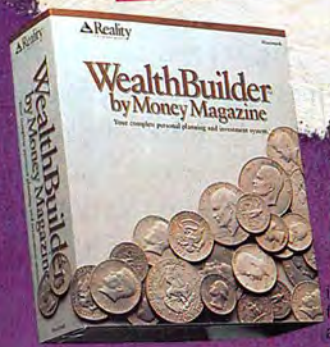
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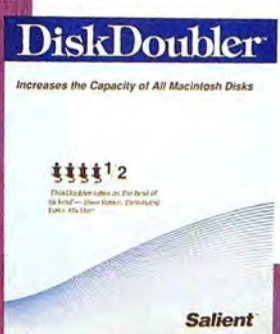
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- All of Mac Tutor 160.
- Disc Tracy 75.
- The USA Factbook 75.
- The CIA Factbook 80.
- Baseball Guide & Register . 138.
- Vietnam Remembered 69.
- GEM- Public Domain 75.

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Avery Labels
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Casio
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- CasioLink/Mac 98.

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- Organizer 195.
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- Mac IICX 84.
- The Ultimate SE Case 78.
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Kensington Microware
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- Anti-glare Filter 32.
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- Mac II Monitor Stand 64.
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- Masterpiece Mac II 105.
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- Apple Security Kit 34.
- LaserWriter II Security Kit .. 32.

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- PowerBacker 1200 946.
- Pass Proof 70.
- SideClip 6.

Mac Packs - Linebacker
Navy,Wine or Gray
- ImageWriter Bag 45.
- Mac Plus/SE Bag 55.
- Mac SE Bag Xt 69.

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- SE/Plus w/ext. keyboard 17.
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- Apple 13" monitor & ext. keyboard 18.

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Bogas Productions
- Super Studio Session 2.0 ... 64.

Broderbund
- Jam Session 28.

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- Finale 2.0.1 557.
- Mac Drums 30.
- MusicProse 186.
- Perceive 49.

Electronic Arts
- Deluxe Music Const. Set 82.

Great Wave Software
- Concertware + MIDI 5.0 97.

Mark of The Unicorn
- Professional Composer 375.

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- Professional Performer 375.

Passport Designs
- MasterTracks Pro 4.0 315.
- MIDI Interface 75.
- Note Writer II 295.
- Sound Exciter 48.

PG Music
- Band in a Box 57.

Tactic Software
- Sound Clips 1 - 4 ea. 45.

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Applied Engineering
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Ram Portable 1MB SIMM .. 320.

Connectix
Virtual - Mac II 124.
Virtual - Mac II w/PMMU ... 187.
Virtual - SE/30, IIx, IIcx 114.

DayStar Digital
PowerCache 030 II ci
40Mhz w/o FPU 995.
40Mhz w/FPU 1225.
50Mhz w/o FPU 1750.
50Mhz w/FPU 2050.
Fast Cache IIci 280.
PowerCard 030 25Mhz
II, IIX 1,115.
IICX 1,495.
PowerCard 030 33Mhz
II, IIX 1,495.
IICX 1,875.
PowerCard 030 40Mhz
II, IIX 1,650.
IICX 2,020.
PowerCard 030 50Mhz
II, IIX 2,245.

DayStar Digital
PowerCard 030 50Mhz
IICX 2,625.
SCSI Accelerator - w/o SIMMS
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RAM Expansion - w/o SIMMS
RAM PowerCard 625.

Dove
MacSnap Upgrades
524XE (512KE to 1MB) 195.
524XS (524XE w/SCSI) 260.
596XE (512KE to 4MB) 390.
596XS (596XE w/SCSI) 455.
Marathon 030 Upgrades - Bundled with S.A.M. - S.U.M. & Virtual
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Marathon Racer 170.

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20Mhz w/FPU 995.
25MHz w/o FPU 1,025.
25MHz w/FPU 1,275.
Gemini II 68030 Accelerators
33Mhz FPU 1,575.
40MHz w/FPU 1,850.
50Mhz w/FPU 2,175.
Voyager 68030 for Mac II & IIX
33MHz w/FPU 1,575.
50MHz w/FPU 3,395.
GemKit (Required to install the Gemini, Gemini II or Mercury boards in any Mac below an SE model. Includes internal fan, SCSI port. Specify US or Int'l version) 125.



Datadesk Switchboard

User configurable keyboard. Modular design allows user to arrange the alpha, cursor, and Numeric keypads into many different position. Other devises, (trackball, and vertical function keys, digitizer tablet, programmable macro keys, etc.) may be substituted or otherwise added to the keyboard as well

Switchboard $170



Logitech ScanMan Model 32

ScanMan achieves 32 gray scale through software for optimum laser printer output. Advanced halftoning provides superior image quality on black and white monitors and imageWriter, DeskWriter or other non-PostScript printers. Image editing software features a 32 gray color palette, dimension box and tear-off tool palette for extra convenience.

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DS/DD 10 pk 11.
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HD Rainbow 10pk 21.

Sony Disks
DS 10pk 13.
Bulk DS/DD (50 pk) 39.
HD (1.44 mb)10pk 22.
Bulk HD (50 pk) 90.

Modems & Fax

Abaton
InterFax 12/48 261.
InterFax 24/96 417.
InterFax 24/96-220V 417.

Applied Engineering
2400 MNP 5 Ext. 195.
2400 MNP 5 Int. 250.
2400 MNP 5 Send FAX Ext. 225.
2400 MNP 5 Send FAX Int 275.
2400 MNP5 Send FAX Port 205.

CompuServe
Membership Kit 22.

CompuServe
Navigator 3.0 48.

Dove
DoveFax 24/96 278.
DoveFax Plus 395.

Everex
EMAC MD2400 MNP 5 175.

FreeSoft
Second Sight 85.
White Knight 11 84.

Hayes
Smartcom II 3.1 84.

Microcom
MacModem v.32 MNP 9 ... 675.

Orchid Technology
Orchid Fax Modem 435.

Preferred Publishers
Double Talk twin pack 115.

Prometheus
Modems come with cables & Macknowledge
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MacFax 9600 750.
FAX Modem Portable Int. . 204.

ProModem
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2400 SE Int.(MNP5) 245.
2400 II Int.(MNP5) 259.
9600 V.32 750.

Shiva Corporation
NetModem V2400 410.
NetModem 9600V.32 1,375.

Software Ventures
Microphone II 3.0 214.

Solutions
BackFax 138.

Solutions
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Supra Corp.
Supra 2400 118.
Supra 2400 MacPac 178.

Synergy Software
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True BASIC, Inc.
True BASIC Language 2.02 52.

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ZBasic 98.

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Sigma Designs
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210Mb Cobra External .$1475



PLI Infinity 40 Turbo Removable Hard Drive

The Infinity 40 Turbo uses PLI's turbocharged driver software to attain a 20ms access time, and with the TurboCache disk accelerator software and TurboBoost, you can achieve near zero effective average access times. This removable 45MB drive gives you infinite storage potential with removable cartridges. Each one holds 44MB and costs only slightly more per megabyte than floppy disks.

40 Turbo Removable $750

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20 Mb Drive $299





La Cie Tsunami

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40 mb Drive ... $629



Applied Engineering 1.44 mb Drive

Applied Engineering's SuperDrive-compatible 1.44 Mb high density drive looks, feels runs, reads, writes, stacks and even smells like Apple's But it costs hundreds less. Access files almost instantly and copy disks without continually swapping disks. This drive incorporates the same high quality Sony Mechanism Apple uses and features auto-eject MS-DOS compatibility and exclusive two-way read/write indicator light. Also available in 800K.

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Emac - Impact
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Education

Addison Wesley
Inside Macintosh, Vol. 1-5ea18.
Inside Macintosh, X-Ref 8.
Mac Programming Primer . 21.
Mac Programming Secrets 19.
Programmers Online Companion 2.1 35.

Bright Star
Alphabet Blocks 29.
Talking Tiles 25.

Brøderbund
Calculus 57.
Geometry 57.
Physics 57.
Type! 17.

Carina
Voyager 1.2 86.

Davidson & Associates
Math Blaster - Mystery 29.

Earthquest, Inc.
Earthquest 48.

First Byte
The Dinosaur Discovery Kit 25.
Kid Talk or Math Talk ea33.
Math Talk Fractions 26.
Spell-A-Saurus 30.
The Puzzle Story Book 26.

Goldstein & Blair
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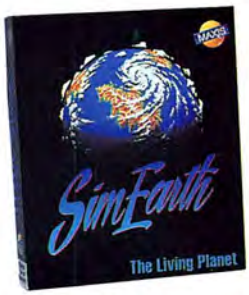
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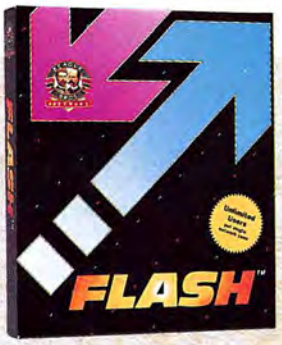
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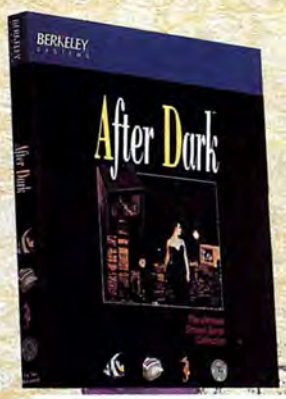




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GUY KAWASAKI

The Stealth Mac



When your company's MIS goons try to park a PC on your desk, how do you resist? Here are a few ways, ranging from subtle to downright audacious, to mount a Mac attack.

My wife recently started a job at a company in which the Macintosh is not an approved computer. This has been difficult for her. She, in turn, has made it difficult for me, because she's vented her frustration at home every night.

I now have a better understanding of what many of you have gone through to get Macs into your companies, and I got to thinking about how to get Macs into an anti-Mac company. This column is about how to change the world, one company at a time.

The best time to get a Mac is when you are negotiating a job offer.

Any company worth working for will let you use a Mac, and any company that won't isn't worth working for. Therefore, you should negotiate the use of a Mac in the interview process and have it written into your offer letter. This will really be a first in the annals of recruitment.

Be prepared for pointed questions during the interview process such as "Can the Mac run DOS software?" "Can it connect to our PROFS mail system?" "Are the files transferable to the other PCs in the office?" You can just lie and say that Macs can do all these things, because no one will ever check. If you're caught, you can always say that an Apple employee told you so.

What should you say if your prospective boss expresses reservations about the stability of Apple and its ability to provide service and support? Say that Apple and Sony are forming an alliance to build computers so there will always be a source for Macs. Plus, everyone knows that Sony is a great company, so Macs can only get better. How can anyone argue with that logic?

There's one more way to convince a boss to allow you to use a Mac. Say that you already own a Mac Portable, so when you are traveling you can do lots of work on the road. (My wife did this, and it worked a little. She seriously thought that I would let her borrow my Portable.) Telling your boss this serves two purposes. First, it may help you get a Mac. Second, it shows you how much the boss knows about the weight of the Portable.

The First Few Weeks

As soon as you start in a new position, find other Mac-heads inside the company. They're bound to exist — probably hiding out in the design or marketing departments. Your task is to find them and band together for warmth and protection. It's hard to argue with the logic of "I saw other employees using Macs — why can't I?"

You might want to form an internal Macintosh user group to institutionalize Mac camaraderie. If you do, please ask me to speak at your company, because there's nothing I like more than speaking to a predominantly blue company.

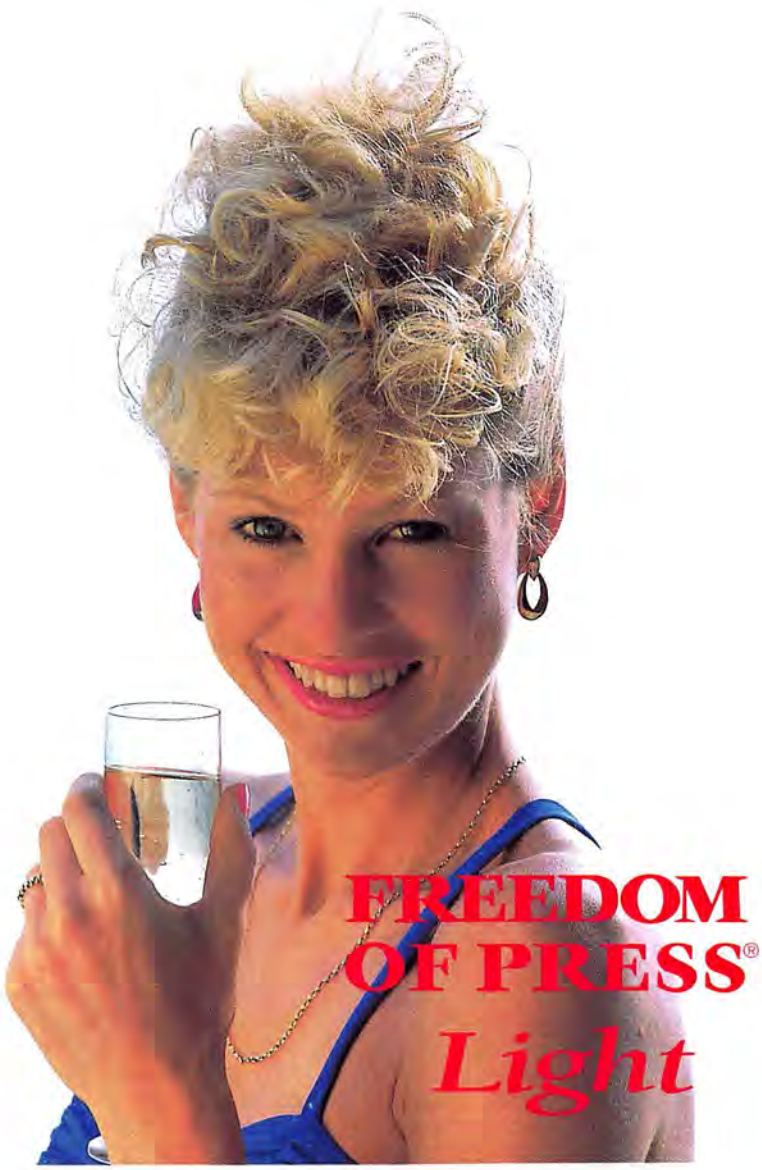
You should also look for some strategic alliances among your company's vendors. For example, many advertising and PR agencies use Macs, so tell your boss that you need Mac file compatibility to work with the company's outside agencies. If you have to, tell your boss that you can *eliminate* the outside agencies if you use a Mac. This is a high-risk strategy, but you've got to do what you've got to do.

If the company reneges on letting you use a Macintosh, whip out the aforementioned offer letter and use it to threaten a wrongful-hiring lawsuit. Admittedly, wrongful hiring is an untested area of litigation (as opposed to wrongful termination), but it certainly sounds intimidating. Get your company's human-resources department involved; it will usually side with employees against management because of the fear of costly personnel lawsuits.

Suppose that you can't find other Mac users and you're taking some heat for using an unapproved computer. Then what should you do? I say fake 'em out by making your Mac look like a PC clone. Buy a 13-inch Sony color monitor that looks a lot like a PC monitor. (After a few months, you can switch to a Radius Pivot, and no one will be the wiser.) This may require getting some long cables so that you can put your Mac II or LC onto the floor away from the ignorant, prying, and resentful eyes of the MIS police.

If the MIS police ask how you got your computer, lie to them. Tell them that it's a PC clone and that it took weeks to install it, so you can't bear to take it out. This will generate empathy, because they've gone through the same tedious process many, many times. Who knows, they might even give you copies of 1-2-3 and WordStar to use on your "clone."

The MIS police may look at your screen and ask why it has icons and pull-down menus. This is easy to handle: Tell them you're running Windows. If they ask how there could be so much software on your hard disk, then you have a serious problem. At this point, it's best



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See us at MacWorld Expo, San Francisco

If all else fails to get Macs into your company, quit and find another company.

to 'fess up and tell them your computer is a Mac. "Hey, guys, it was a joke."

Your Responsibilities

Part of the responsibility of using a Mac is setting new standards for the quality of memos, correspondence, and overheads. Everything you produce had better be beautiful — having some content might help too. And don't use 16 different fonts plus boldface, underlined, outlined, and shadowed text in your documents.

When other people see how much better your output looks, they'll get output envy and want a Mac too. Soon there will be a bottom-up revolution demanding more Macs. Then you'll either be a hero or looking for another job. If you think you're in trouble, don't worry: Call human resources again, and whisper the words "wrongful termination." You probably aren't going to get fired for starting a Mac revolution, but if you do, you may make millions because of it. Plus, all the other Mac owners may join you in a class-action suit.

In general, try to make yourself valuable as quickly as possible. This way, if the company tries to squash the Mac revolution, you can threaten to quit and it will back down. You can even use this technique in companies in which the Mac is approved. Suppose, for example, that you want more RAM or a bigger hard drive. All you have to do is mention that another company offered you a position with better equipment. You get the idea.

If all else fails to get Macs into your company, then I suggest that you quit and find another company. Sure, this is easy for me to say — I don't have your mortgage, your kids, or your car payments. But you only live once, so why be stuck using a PC?

Also, I'm a writer, and a writer is supposed to portray things as they should be — not as they are. One more thing: I'd love to hear how you got your Mac into your company. It may be a big help to my wife. We need to know right away, so skip analog mail and E-mail me in the Columnist Section of the MacUser forum on Zmac.



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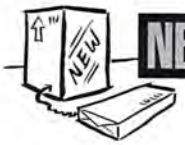
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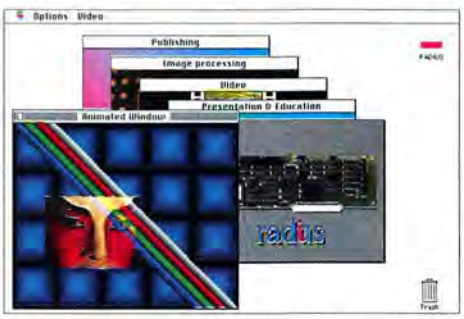
NEW ON THE MENU

Back to the future: In the halcyon days when Elvis meant Presley and crack was something that happened to your driveway, 3-D movies — complete with cardboard glasses — were the rage. Well, "They're baaack!" ModaCAD ([213] 312-6632), maker of vertical CAD software for the fashion industry, has introduced ModaVISION, a 3-D-modeling and -visualization system that, yes, uses glasses to achieve a stereoscopic effect, so your creations seem to pop out of the screen. What's next — Macs with tail fins?

By Russell Ito



TV or Mac TV? Take a quick tally: How many TV sets do you own? And how many Macs? Chances are, you've got more TV sets. The question is: Why? The much-projected convergence of computing and television is here, and you may never look at your TV set again. RadiusTV is the most sophisticated integrated-video product released so far. It can compile a transcript from closed-caption information on the fly, and with a little developer support, it'll even be able to use that information for keyword searches that trigger a VCR. Radius' Video Collage goes even further than RadiusTV, packing enough real-time video effects onto its two NuBus cards to make even George Lucas blanch. Strictly an OEM product, Video Collage will show up in some integrated systems starting this summer. (408) 434-1010. But suppose you need acceleration first and you want to add live video later. Most cards don't give you any growth options, but MegaGraphics tells us that it will introduce a multifunction card in May that will have more open slots than an Atlantic City casino. You'll be able to upgrade from 8- to 32-bit color and add NTSC or PAL video with real-time frame capture and two compression options: One for live video at 30 frames per second, the other for still images. The card will ship with software-addressable accelerator chips on the board, which MegaGraphics says will let users upgrade to better acceleration levels with just a software driver. (805) 484-3799. Integrated video is here, which is a lot more than you can say for high-definition video. And with Apple and Sony huddling together, who knows where this could be heading — maybe a 32-inch XBR with a trash can in the lower right corner? So the next time you switch on your TV set, ask yourself why you're not watching your Mac instead. *That*'s the question.



Up to Date . . .

Publish It! Easy, Timeworks' low-end page-layout package, has been boosted to version 2.0. $249.95. (800) 535-9497 or (708) 948-9200. UltraPaint version 1.02 fixes the copy-and-paint bug cited in our review (September '90, page 69), making the program an even better choice for those seeking a do-it-all 8-bit painting/drawing package. $199. (305) 594-6965. ProGraph, the Eddy-award-winning graphics-programming environment, has been upgraded to version 2.0 and now includes a compiler. $395. TGS Systems (902) 429-5642. Now Utilities 2.0 boasts the inclusion of SuperBoomerang, extended file management, INIT-launching capability, and more. $129. Now Software (800) 237-3611 or (503) 274-2800.



Proxima's Cyclops system uses a smart camera mounted on a Proxima projection panel and an LED-tipped pointer to bring the presenter back into the action.

Proxima's Presentation Pointer

Most presenters practice a form of computer ventriloquism: They sit at the computer and talk while the audience watches a projected screen. But now Proxima has introduced Proxima Cyclops, a system that brings the presenter back into the picture. The Cyclops package uses a camera mounted on one of Proxima's LCD projection panels to map the projected image to the Mac's screen coordinates. The presenter uses an LED-tipped, 36-inch pointer to move the cursor and send mouse clicks back to the Mac, in effect turning the projected desktop into a large touch screen. For situations in which the presenter wants to be closer to the audience, Proxima also offers a laser pointer that's effective as far away as 20 feet from the screen. Currently, the Cyclops works only with two of Proxima's LCD panels — the MultiMode II and VersaColor II — and it is sold separately.

Proxima, 6610 Nancy Ridge Drive, San Diego, CA 92121; (800) 582-2580 or (800) 582-0852 (in CA). Cyclops, $1,195. MultiMode II, $2,199. VersaColor II, $4,795.

MacDraw Turns Pro

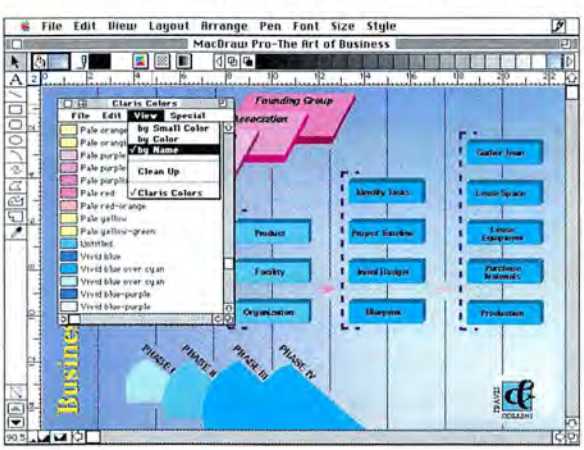
After lying low for nearly two years, MacDraw is back. Claris' MacDraw Pro, which replaces MacDraw II, is no longer a mechanical drawing program but is now a complete illustration and presentation software package. MacDraw Pro is a 24-bit program with full Pantone support and multiple customizable-color, pattern, and gradient palettes. The floating palettes use a Finder-like interface that makes staying organized easier, and items can be named and arranged much as they are in FreeHand 3.0. Frequently used palette items can also be moved into a favorite bar that doesn't require a palette at all. Every text block now includes MacWrite II's ruler, giving you the power of a word processor in every block. True tabs (including decimals), superscripts and subscripts, and custom leading and tracking are all available. Every paragraph in a text block can be formatted from the ruler, and the block will resize automatically. Creating curves is easier with MacDraw's new curve tool, although a conventional Bezier tool is also available. Claris' XTND architecture makes importing and exporting files transparent. On the presentation side, you can create full on-screen slide shows, and slides or layers can be copied and pasted from one file to another. Although there are no thumbnails, you can rearrange named files in a slide show with just a click and drag. MacDraw Pro should be available in the second quarter of 1991.

Claris Corp., 5201 Patrick Henry Drive, Santa Clara, CA 95052; (800) 544-8554 or (408) 727-8227. $399.

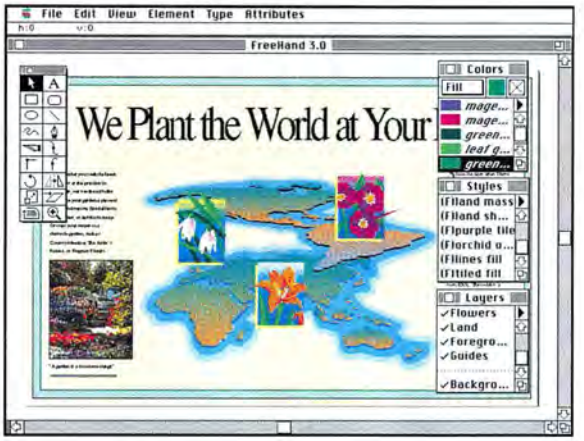
Print to DiskPaper

Although the paperless office is still as elusive as the Holy Grail, Farallon Computing's DiskPaper is the latest advance in the crusade. A print-to-disk utility, it creates full-color documents that can be self-launched and annotated with audio cover notes. DiskPaper creates images of the original document, displaying the original's fonts whether or not the host computer has those fonts installed. This makes sharing documents easy, because everyone sees the same thing regardless of their own configuration. DiskPaper documents can be printed normally, and the program also offers some basic security options. Although recipients can't change a DiskPaper document, they can copy and paste text and graphics from a DiskPaper file (although copying structured text, such as a spreadsheet, can be problematic).

Farallon Computing, Inc., 2000 Powell Street, Suite 600, Emeryville, CA 94608; (415) 596-9100. $149.



MacDraw Pro hardly shows its mechanical-drawing roots. Claris' upgrade adds extensive color, text, and pattern controls that take the program into the areas of presentation and illustration.



FreeHand 3.0 packs some major improvements. The palette windows you see along the right make manipulating colors and layers as simple as a click and drag.

FreeHand 3.0 at Last

Hard on the heels of the just-released Illustrator 3.0, Aldus has announced FreeHand 3.0, which, among other improvements, boasts major enhancements to its drawing interface and text-handling capabilities. Color work has been simplified with a custom color palette that lets you name often-used hues and then rearrange them simply by dragging. You now have an unlimited number of layers that you can name and arrange just as you do your custom colors, and you can view and print any or all of the layers. You can cut transparent holes in objects, and FreeHand now includes an auto-tracing tool that can handle multiple objects. Type 1 and Type 3 fonts can be converted to editable outlines, and text effects can be viewed on-screen (but they must be created in a dialog box). You also have extensive control of the way text is joined to a path (by baseline, ascenders, or descenders). Freehand 3.0 should be available during the first quarter of 1991.

Aldus Corp., 411 First Avenue S., Seattle, WA 98104; (800) 333-2538 or (206) 622-5500. Price not set at press time.

PowerCache IIci Beats Mac IIfx

Mac IIci owners craving Mac IIfx speed don't have to feel frustrated anymore. DayStar Digital's PowerCache IIci is a combination accelerator-and-cache-card that, according to DayStar, can boost a IIci's performance beyond that of a IIfx in some operations. The PowerCache comes in 40- and 50-megahertz configurations. Users can buy the PowerCache with or without a math coprocessor.

DayStar Digital, Inc., 5556 Atlanta Highway, Flowery Branch, GA 30542; (800) 962-2077 or (404) 967-2077. 40 MHz PowerCache IIci, $1,299 (without 68882); $1,599 (with 68882); 50 MHz PowerCache IIci, $2,299 (without 68882); $2,699 (with 68882).

Kodak Color

Kodak set a standard at the high end of color printing with the XL7700, and now it's trying to do the same at the low end. The Diconix Color 4 printer is a four-ink (cyan, yellow, magenta, and black) inkjet unit that maintains the Diconix small-footprint, low-rise design. The Color 4 can print on plain paper without smudging, and because the inks aren't water-based, it can print onto special transparencies. By using a separate head for each ink color, the Color 4 saves money; users need only replace the individual used-up cartridges. The Color 4 is quiet (only 45 decibels), supports cut-sheet and tractor paper, and offers 192-x-192-dpi resolution. But there is no AppleTalk option.

Printer Products Division, Personal Printer Products, Eastman Kodak, 901 Elm Grove Road, Rochester, NY 14653; (800) 344-0006. $1,595.



The Diconix Color 4 printer from Kodak is an inexpensive color inkjet printer that can print on plain paper.

NewsLine

Reports and Analysis

Motorola-Hitachi War Over

SCHAUMBERG, IL — Bringing a nearly two-year-long patent-infringement dispute to a close, Motorola, Inc., and Hitachi, Ltd., have formally settled their suit over Motorola's 68030 and Hitachi's H-8 microprocessor. At one point, a federal judge's order threatened to halt all shipments of the 68030 chip, the heart of the Macintosh line. Although no terms of the settlement were disclosed, it's believed that a cross-licensing agreement has been reached, with Motorola either conceding some patent rights to Hitachi or agreeing to pay a nominal royalty fee. Both companies were expected to ask for dismissal of all the pending cases related to the suit.

IBM-Motorola Chip Talks Fail

NEW YORK, NY — Just as news of its settlement with Hitachi was breaking, negotiations between Motorola and IBM over its licensing of IBM's 4-megabit-chip design reportedly collapsed. IBM is now the only U.S. maker of the high-capacity chips, and an agreement was hoped for as part of a proposed U.S./European bid to compete with the Japanese. Motorola is now expected to use technology from Toshiba to produce its 4-megabit chips.

Lotus Settles Copyright Suit

CAMBRIDGE, MA — One "look and feel" case is over. Lotus Development announced it has accepted an out-of-court settlement of its lawsuit against Paperback Software. Lotus sued Paperback in 1987, charging it with copying the look and feel of Lotus 1-2-3. Paperback's settlement included a half-million-dollar payment to Lotus and the removal of its three V-P Planner spreadsheet programs from the market.

Apple/Beatles Suit to Court

LONDON — The suit between Apple Computer and Apple Corps., Ltd., the Beatles' management company, has gone to trial before the High Court of England's Chancery Division. The court will decide if Apple Computer's ventures into MIDI, the AppleCD SC, and the sound chips in the IIgs and Mac family violated a secret 1981 agreement that let the computer company use the Apple name and logo if it stayed out of the music business. If Apple Computer loses the suit, the Beatles' company could insist that Apple change its name.

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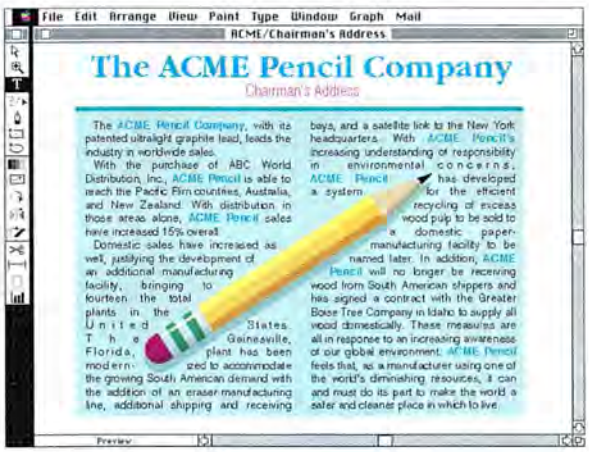
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DRAWING AND PAINTING

Illustrator

The enhancements in Illustrator 3.0 make it the best drawing tool you can buy. Period.



Illustrator 3.0 is the best drawing tool around. Its new text-handling features include automatic text wrap, shown here. You can now change fonts, sizes, styles, leading, and character colors as well as many other characteristics within any text field on-screen.

Illustrator isn't just a drawing program any more. With major improvements to its text functions, the addition of some new drawing tools, and a complete charting function, Illustrator 3.0 clearly separates itself from its nearest competitors (FreeHand and Canvas).

Hot Type

Illustrator's biggest improvement is in its text handling. You can change fonts, sizes, leading, styles, and colors within any text block on-screen. Tracking, automatic kerning, word and letterspacing, hanging punctuation, auto-leading, paragraph spacing, horizontal scaling of characters, adjustable superscripts and subscripts, justification, and discretionary hyphenation have all been added to the text controls, and they all work well. Even if the text block is skewed, rotated, or scaled, the cursor creates an insertion point wherever you click, letting you edit your text directly.

You can now enter text in several ways (including importing it from a word processor): in an area block, on an oval or line, and within a polygon. Text can flow from one area block to the next, but there are no tab stops or automatic hyphenation. The lack of tab stops means that when you add bullets to a text field, you must add an adjacent text block that you may have to realign manually when you edit your text.

Creating initial caps — a large capital *I* at the beginning of a story, for example — is a real problem, because Illustrator does not automatically indent the succeeding lines when the first character is given a negative vertical shift. You can use the new automatic-text-wrap feature to wrap the text around the first character, but to do that, you must first make the initial character an outline, which makes it harder to edit it later. Additionally, if your initial cap is an *A* or a *T*, the text block wraps around the letter's legs, which is incorrect. The best way to make an initial cap is to indent the first few lines and create an additional text block for the rest of the story after the initial cap. Your text can then be automatically flowed into place, but this is a clumsy workaround.

Text on a curve works without a hitch and is extremely intuitive. You can have your text run around the outside of an oval or around the inside. You can also enter the text along a line and then move it along the path. Text within a polygon works well in filling a polygon with characters, but without automatic hyphenation, letters sometimes run into the edges of the polygon you want to fill.

Adobe includes ATM (Adobe Type Manager) in the package and has added the ability to create character outlines instantly, for customizing each character. These characters can become masks for blending colors, or you can cut them apart and manipulate them in ways never dreamed of without an additional program such as Fontographer.

Text can automatically flow around a graphic object, but again, without automatic hyphenation, the word spacing looks awkward. Adobe recommends that you create an additional object beneath the object you want text to flow around, which gives you greater control over individual character positions. In addition, the processes you go through to manipulate text must be followed exactly to get the text to flow around a path or flow from one block to another, and the processes themselves aren't particularly intuitive.

A Bigger Toolbox

Adobe has not changed Illustrator's drawing tools much, except to add three notable new types: the direct-selection tool, the path-adjustment (scissors) tools, and the charting tool. The direct-selection tool lets you select polygons without ungrouping them from other parts. This means that once the art is in place, masked and grouped, you can go into the group and edit its parts. In addition, you can use all the transformation tools (scale, rotate, flip, and skew) on anchor points selected within these groups.

For longtime users, the direct-selection tool takes some getting used to. When I first started using it, I completely destroyed a grouped piece in minutes. Once I'd gotten the hang of it, though, I found it a real pleasure to use and an amazing way to maintain my creative flow rather than worrying about whether I had followed the proper procedures for groups and masks.

Adobe has changed the scissors tool to three path-adjustment tools, which provide much greater control when you edit polygons. The original scissors tool, which lets you simply add an anchor point to a line, is still there, as is a scissors tool that lets you convert a corner to a curve or a curve to a corner. The third tool lets you completely remove an anchor point (creating a curved line between the next two closest connecting anchor points, using the direction lines of those two anchor points).

When you click and hold on a tool that has a modifier, the modified tools appear next to the original tool. You can access the direct-selection tool by clicking and holding on the selection tool or by holding the Command key down and pressing the Tab key to toggle between the selection and direct-selection tools.

A duplicate tool, which does the same thing as pressing the Option key, has been added to each of the transformation tools, and a draw-from-center option, which does the same thing as pressing the Shift key, has been added to the oval and rectangle tools. Illustrator has always used

modifier keys, and because pressing a modifier key is easier and faster than selecting a palette tool, I have no idea why Adobe added these tools.

Illustrator 3.0 lets you select a line segment and move it — regardless of whether you've selected an anchor point or not. However, I find it more intuitive to modify only those lines that have a selected anchor point.

Charting the Course

Illustrator's new charting tool is powerful and easy to use. Simply select the tool and click on and drag an area, and a dialog box appears, asking you to fill it with numbers. When you've entered the data (you can also import data from a spreadsheet), Illustrator creates your chart. The chart types include bar, stacked-bar, pie, scatterplot, area, and line charts. (I would use this tool for the charts in *MacUser*, but creating a horizontal bar chart requires an incredibly crude workaround that's more trouble than it's worth.) The idea of having a drawing program with all the power of Illustrator providing a database link is positively ingenious.

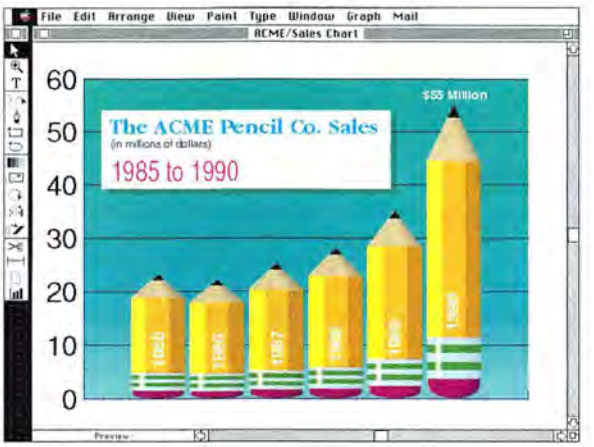
Artists can add an infinite number of creative effects to bar charts by creating an art object and designating it as a chart unit (the *USA Today* look). The program automatically scales the art object appropriately. You can incorporate patterns into area charts, control the colors used in line and scatterplot charts, and more.

Designer Commands

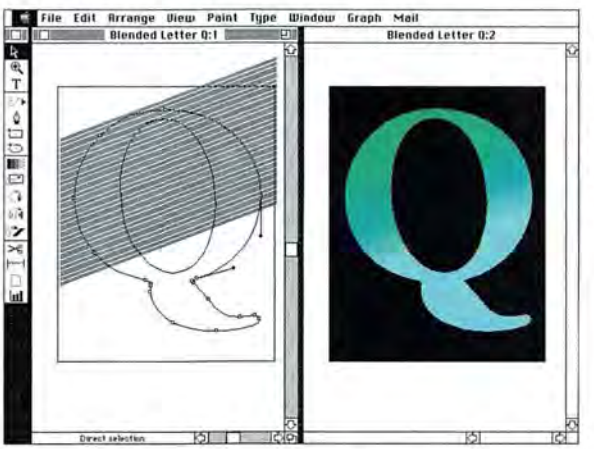
Adobe has changed Illustrator's commands to better suit designers. The Move dialog box, for example, now resides on the Edit menu instead of being hidden under the selection tool. You can now convert graphic objects into guides or drag guides from the rulers for alignment (but *objects* do not snap to the alignment guides — only the cursor does — so you need to select objects carefully).

You can now complete punch-outs (the ability to see through a "donut hole") by selecting the art objects and choosing Make Compound from the Paint menu. Because a compound graphic automatically becomes a grouped object, the direct-selection tool is very helpful and makes modifying the compound, as well as any other groups, easy.

Rather than waiting for a complete screen redraw to preview the entire screen, you can now preview just selected items, and you can undo your last command after previewing. A new Apply button in the Paint dialog box lets you view an effect in the Preview mode without clicking on OK (and maybe having to undo the action).



Illustrator's charting tool lets you enter numbers into a field or import numbers from a spreadsheet and automatically create charts. You can then apply a graphic object to the numbers, and Illustrator automatically incorporates and scales the object to match the numbers in the spreadsheet.



Some of Illustrator's many new features are character outlines and compounds. The combination of these two features enables you to give characters creative fills.

You can now view placed images in gray scale or color, and the split-path tolerance has been changed to either on or off. You can develop and save a user-preferences file that makes specific fonts, patterns, custom colors, and graph designs immediately available on launch. The printing scheme has been changed so that the active page is page 1 (not page 5), but tiled pages are still available. Adobe has opted to keep the drawing area limited to 16 x 16 inches, even though many artists find it restricting.

The manual is well written, and the package also includes a quick-reference card, a gallery disk and color guide, ATM, DrawOver, and Separator.

The Bottom Line

Illustrator 3.0 successfully tackles its predecessor's creative and technical limitations while adding exceptional features. Although it lets you create full-page documents, it does not offer the text-formatting accuracy of QuarkXPress or Aldus PageMaker.

FreeHand may have greater layering and color control and, until now, better control over text, but Illustrator's vastly improved text-handling, charting, and direct-selection tool plus bundled extras (ATM, DrawOver, and Separator) make it the best drawing program currently available.

— K. Daniel Clark

Get Info

Illustrator

★★★★½

Published by: Adobe Systems, Inc., 1585 Charleston Road, P.O. Box 7900, Mountain View, CA 94039; (800) 344-8335 or (415) 961-4400.
Version: 3.0.
List Price: $595.

DRAWING AND PAINTING

Studio/32

Electronic Arts follows Studio/8's success with a 32-bit winner.

Success breeds success. Studio/32 is Electronic Arts' worthy 32-bit successor to Studio/8. Studio/8's strength is its thoughtfully designed interface; Studio/32 maintains and expands that interface, providing access to 16.7 million colors and an assortment of new features and powerful tools.

In Full Color

Studio/32 supports the Pantone and CYM (cyan, yellow, magenta) color models commonly used in graphic arts and printing, as well as the RGB (red, green, blue), HSV (hue, saturation, value), and HSL (hue, saturation, luminance) models used by the Mac and other video-display systems. The program lets you work in 8-, 16-, 24-, or 32-bit color.

For convenience, Studio/32 provides four 256-color palettes per painting, but that doesn't mean you're limited to 1,024 colors. You can custom-organize palettes, save any number of them, and switch among them freely without changing any colors already in your document. And if you're working in 24- or 32-bit mode, your colors don't have to appear in a palette at all. To match a previously used color, just click on it with the eyedropper tool.

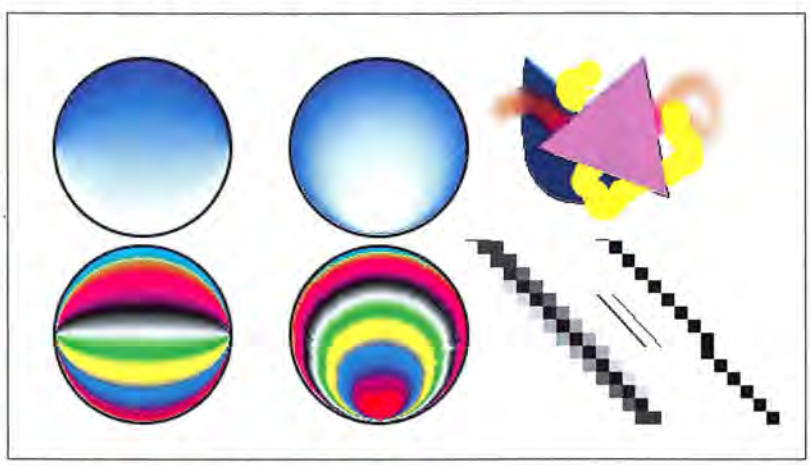
If you need more choices, you can select colors from a screen version of the Pantone 747 XR Color Formula Guide, the color square (which automatically generates color gradients between colors of your choice), or Apple's color picker or you can mix custom colors much as you would with tubes of paint. You can also control any color's transparency.

Using color effectively, however, often means restricting your color usage. Studio/32 provides powerful selection tools for selecting or excluding areas or colors for editing. Masking lets you protect either an area or a specified selection of colors.

The Right Tools

All of Studio/32's tools are responsive. Besides standard shape tools, the program provides two curve tools: One draws single curves between two endpoints, and the other draws complex Bezier curves. You can edit Beziers repeatedly until you select another tool.

In addition to behaving as they always have, the standard lasso and rectangular selection tools can be set to expand or shrink to include or exclude specified colors. You can even specify that any occurrence of excluded colors that appears within a selection (those completely surrounded by colors you want) becomes transparent.



This sampler of Studio/32's features offers a hint of what this powerhouse program can do. The upper and lower gradient-filled circles on the left show the smooth color transitions of linear gradients. The center circles use the same gradients, but this time they are radial (shape-sensitive). The magenta triangle at the upper right shows the effect of a mask. The diagonal lines, shown at actual size and at 800 percent demonstrate the benefits of anti-aliasing.

The magic wand, an additional selection tool, lets you make selections by color. Click on a color, and all the contiguous pixels of the same or similar colors are selected. In the Tolerance dialog box, you can set a width for the range of colors that will be included. With any of Studio/32's selection tools, you can also select multiple separate parts of your painting simultaneously and treat them as a single selection.

Selected areas can be filled; colorized; merged into other images at any transparency setting or transparency gradient; shadowed; embossed; traced; blended; flipped; rotated freely or by degrees; resized freely or by percentage; and distorted, bent, and stretched in several ways. In addition to using the standard 1- and 2-point perspectives, you can predefine any perspective by adjusting the *x*-, *y*-, and *z*-axis settings of a flat plane in a dialog box and apply that perspective to your selection. A unique effect is spherization, which turns a nonspherical selection into a spherical one. There are two types of spherization: One is like creating a globe by wrapping a flat world map around it; the second looks more like the distorted effect of a fish-eye camera lens.

Studio/32 provides airbrushes that are reminiscent of the real thing. Eight different airbrushes are available at any time, and you can edit them to produce new effects as needed. The up and down cursor keys switch sequentially among the current eight airbrushes — a decided convenience.

Gradients and Blends

A 32-bit-color program's greatest strength is its ability to render smooth gradients from color to color. The virtually unlimited number of in-between shades available among 16.7 million colors makes this possible. Studio/32's Define Gradient dialog box lets you configure and store up to eight gradients per document, each of which can contain up to 32 colors. As with color palettes, you can later edit any gradient without affecting your document.

When you specify one of your gradients as the foreground color, the gradient fills your filled shapes and shapes that have been filled with the paint can. You can specify either linear gradients or gradients that follow the shape you've drawn, and you can also set the angle at which the gradient will flow. The gradient also becomes the current paintbrush.

The water-drop tool blends or sharpens the differences between adjacent colors. The smudge tool acts like a finger with a dollop of paint on it. When you push it through other colors, the color on the finger mixes with them — at first visibly but then less so as the paint on the finger is used up. These effects are nearly impossible to achieve with 8-bit-color programs.

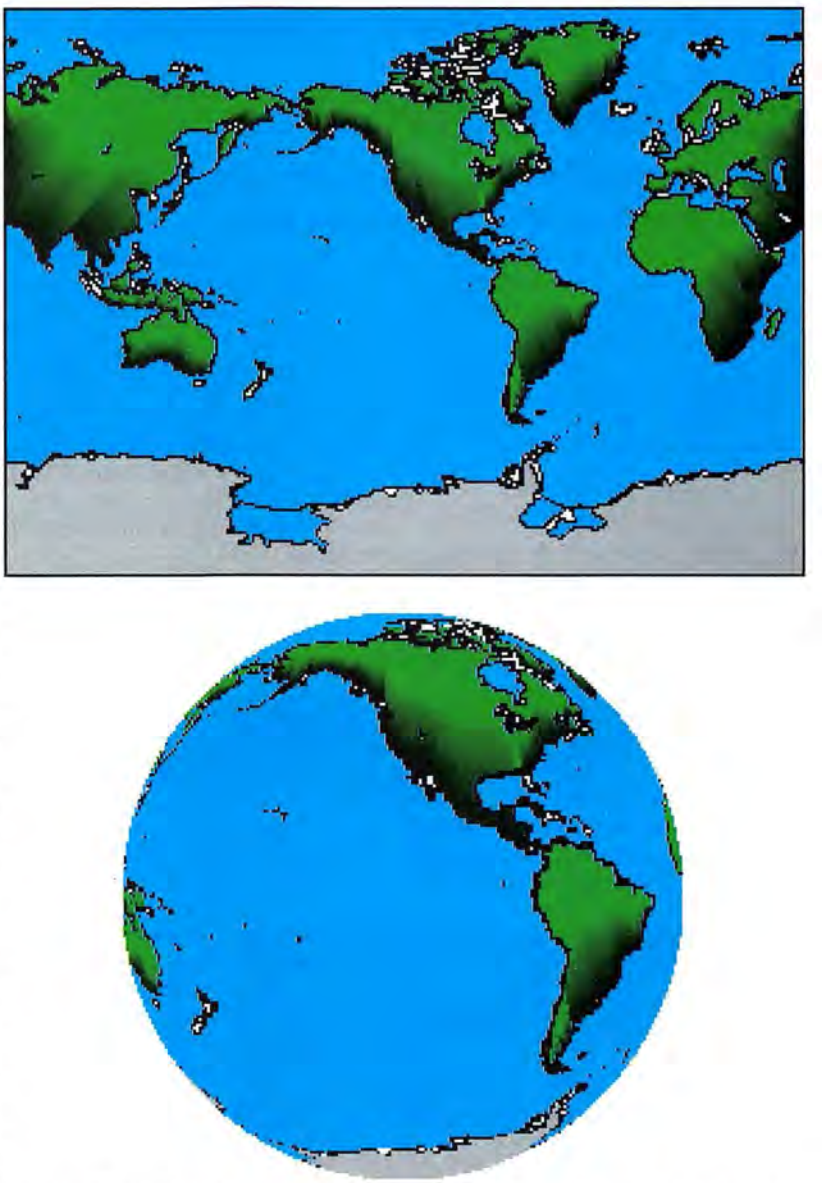
You can select among three levels of anti-aliasing — none, low, or high — for the drawing tools. This helps minimize the jaggies in diagonal and curved lines, even in low-resolution pictures. The anti-alias brush is an alternative paintbrush that paints without any jaggies and also doubles as a clone tool for precisely reproducing previously drawn parts of your painting that are located elsewhere in your document.

In addition to the standard text-handling method that most paint programs use, Studio/32 provides an additional text layer. Text in that layer continues to be editable via normal word-processing methods yet prints as part of your finished document. This feature ensures high-quality text on PostScript printers regardless of the resolution of the bit-mapped part of the document. You can mix fonts, sizes, and styles within text blocks.

The Bottom Line

As an artist, I regard anything that diverts my attention from my work as an irritant. The best tools become extensions of me, and I use them without thinking. Studio/32 comes closer to being the perfect computer-art program than anything else I've used. Its clean interface and powerful tools combine to do the one thing an excellent graphics program should do: empower the artist without getting in the way. If you want the ideal 32-bit painting program, this is it.

— Darryl Lewis



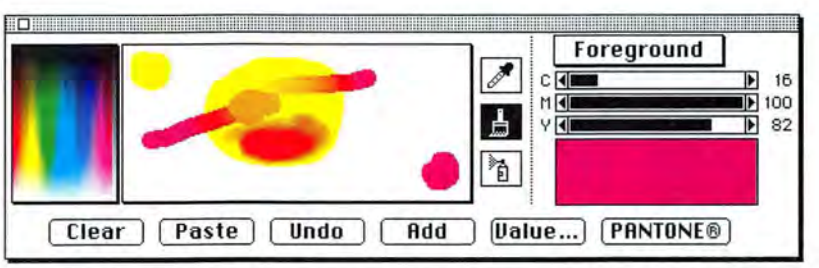
Studio/32's most unusual special effect is spherization. Textured spherization is similar to taking a flat piece of paper and wrapping it around a sphere; here a world map has become a globe.

Get Info

Studio/32

$$$$$

Published by: Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404; (800) 245-4525 or (415) 571-7171.
Version: 1.0.
List Price: $695.



Studio/32's Color Mixer window lets you mix custom colors just as you might with paint from tubes and a palette. Select any color with the eyedropper, paint some in the mix area with the paintbrush or spray can, and then get others and mix them in the same way.

MUSIC

MacProteus and Deck

A synthesizer on a card and a recording studio on a disk — desktop digital recording is here.

MacProteus and Deck are Digidesign's latest additions to its growing family of audio products for the Mac. With Audiomedia, SoundTools, and other hardware/software products, Digidesign is single-handedly creating the field of desktop music production as well as setting the standards for that field.

MacProteus

MacProteus is a "sampling" synthesizer on a NuBus card that fits inside any Macintosh II-series computer. It can play 16-bit linear, 39-kilohertz mono or stereo samples, but it cannot create them. It is essentially identical to the regular Proteus synthesizer sold by E-Mu Systems, except that the full-sized Proteus has six outputs and a keyboard whereas MacProteus has only two outputs and no keyboard. On the other hand, MacProteus doesn't take up any space and doesn't require the rat's nest of wiring often associated with MIDI-keyboard setups. By using Apple's MIDI Manager and PatchBay software with MacProteus, you don't even need an external MIDI interface.

Installing the MacProteus card took me less than a minute; it has simple in and out jacks on the back, facilitating hook-ups to either headphones or a stereo system. I've been using Digidesign's cards with my Bose RoomMate 2/Mac speakers and have had no problems whatsoever — except how to choose among the differing sound sources (CD-ROM drive, Audiomedia, MacProteus, the Mac itself) that can feed the Bose system. I've found a small mixer to be of great value in this predicament.

After setting up the sound outputs and configuring the PatchBay DA from Apple (part of the MIDI Manager system that lets you connect the Mac and MIDI components, using software "patch cords"), I was ready to make music. To access MacProteus' controls, you have to open the Front-Panel application, which is from Opcode and is an adaptation of its Proteus Editor/Librarian program.

Once you're in Front-Panel, all the Proteus sounds — and controls over them — are available. I knew about the Proteus' high-quality sounds and wanted to hear them right away. The writers of the manual seemed to anticipate this response and granted my wish in Chapter 3, "Quick Tour." Front-Panel includes a built-in demo that shows off a lot of what MacProteus can do, and I was able to access it quickly. It was nice to read a clearly written, cut-to-the-chase synthesizer manual for a change.

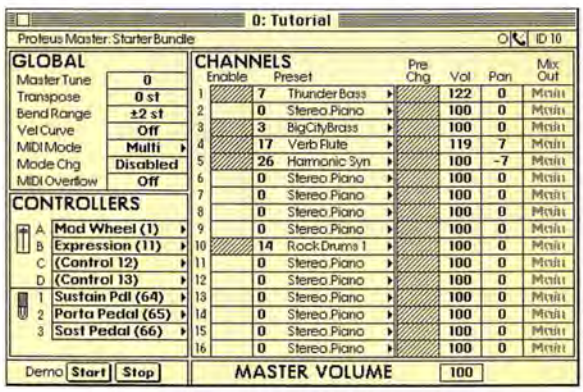
My appreciation soon turned to frustration, however. This manual is short — only 95 pages — and although I normally appreciate brevity, this was one case in which I wanted more and didn't get it. There's a lot missing. Digidesign acknowledged the omissions and told me it had adapted the MacProteus manual from two other manuals: the regular E-Mu Proteus manual and the Opcode manual. It also promised a new, longer, original manual sometime soon. It wasn't difficult to figure out that Digidesign has some kind of deal with Opcode, because the MacProteus manual has enormous plugs for Opcode products liberally sprinkled throughout.

Informational deficiencies aside, MacProteus was easy to use and performed flawlessly on my IIcx. After figuring out most of the workings, I was able to import a sample MIDI file and play it without reading anything more from the manual.

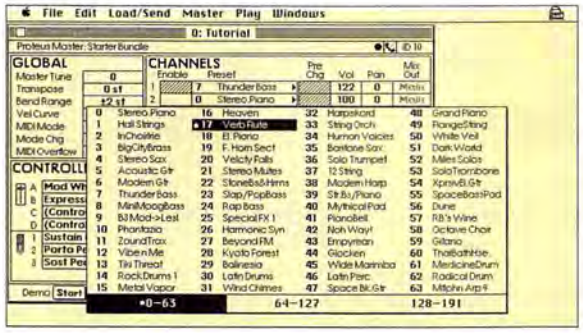
Then I had a surprise: sequencing-program incompatibilities. Performer 3.42 files do not work with MacProteus! The unit is set up to play any MIDI file saved in SMF (standard MIDI file) format — in theory, at least. Only Performer



MacProteus is a Proteus sampler on a card. MouseKeys lets you access the vast number of preset sounds MacProteus has to offer without requiring a MIDI keyboard. This makes it extremely easy to test out new sounds or hear settings imported from other files.



You can reach the heart of MacProteus' prodigious sound capabilities through Front-Panel's Master Parameters window. Here, you can select a sound for any of 16 MIDI channels as well as set global and individual characteristics for those sounds.



You can assign 192 presets, which are divided into 3 banks of 64 each, to the sounds on the MacProteus card. You cannot change banks 1 and 3 (they're in ROM), but you can change bank 2, which is in RAM, with the importation of new sounds.

3.5 files work correctly, however, even though earlier versions also save in SMF format. Of course, Opcode's sequencing programs, Vision and Easy Vision, work just fine. Because Performer's maker, Mark of the Unicorn, wants yet another $95 for an upgrade to Performer 3.5 — the third $95 upgrade in less than a year — I think I'll take the hint and go Opcode.

Deck

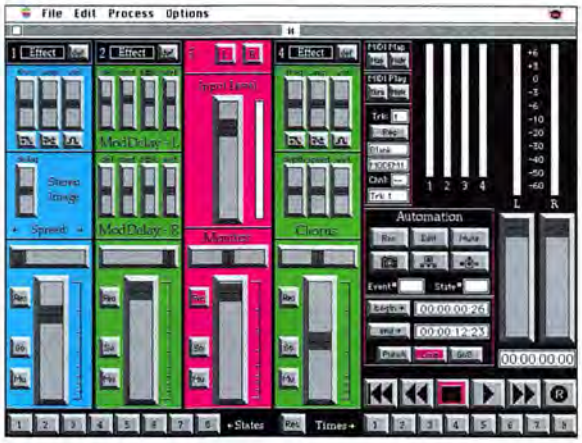
Although synthesized music is sounding better and better, there is still a need to record acoustically created music — and (hopefully) there always will be. Combining MIDI-generated synthesizer files with live music is the ultimate in flexibility for the home recordist, and that's where Deck fits in.

Deck is Digidesign's completely software-generated recording system for the Mac. It looks very similar to Tascam's famous PortaStudio four-track cassette recorder. Because it's only software, Deck requires Digidesign's Audiomedia or SoundTools card to operate correctly. When you purchase either of these cards, you get the Digidesign Sound Designer software, which lets you record two-track audio onto a hard disk, with some ancillary processing.

Deck goes further than that; it is a complete recording environment, capable of unlimited track "bouncing" (a.k.a. ping-ponging) and effects processing along with synchronization to a MIDI file. With Deck you can, for example, create a complex background arrangement with a synthesizer and then record live vocals over it and mix the whole thing down to a DAT cassette. Ship the DAT off to a Northern California CD-mastering facility, and you can have your own custom audio CDs for only a few hundred dollars!

The Deck setup will push your Mac system to its limits. For Deck to work correctly, its destination hard-disk drive must be rated at 28 milliseconds or faster; anything slower, and it chokes. I tried using my backup CMS 80 with no luck; my internal Quantum 80 fared much better. Also, be prepared for the enormous sound files that Deck creates — almost 20 megabytes per minute of recorded music! It is possible to record in 2:1 Compression mode, but this mode offers no special features such as before or after editing, equalization, effects, and so on.

Deck connects to other Mac MIDI applications and hardware via the PatchBay DA. Although the Deck manual contains diagrams that show you how to do this, the diagrams unfortunately appear in three different places in the manual and each one looks different from the others. Although longer and more thorough than the MacProteus manual, the Deck manual is drier and harder to understand and has a somewhat random arrangement. Procedures that should be discussed early on either come up much later than they should or are omitted entirely. On the positive side, like all other Digidesign manuals, it includes a healthy discussion of recording terms and concepts for those unfamiliar with the field.



Deck turns an Audiomedia- or SoundTools-equipped Mac into a digital recorder. The track highlighted in red is in the Record mode; others show differing EQ settings. The MIDI area, to the right of the sliders, lets you import a standard MIDI file and mix and synchronize it with acoustic music.

Once up and running, Deck is a lot of fun to use. Being familiar with the PortaStudio, I had no trouble at all using the Record, Sound-on-Sound, Track Bounce, and Punch-in features. Unlike with traditional recorders, you can actually layer (bounce) a track onto itself and onto other tracks, without noise buildup, and hear the results as you do it.

Although I found it easy to manipulate the sliders/faders and other buttons with the mouse, I missed having a detent position on them, which would have made it much easier to find the center between left and right panning and so on. Holding down the Command key while you click provides written information on control settings, but it's not the same.

It's virtually impossible to move anything with the mouse during playback, because the Mac's CPU fights you all the way. My IIcx has 8 megabytes of RAM, and I still had problems. Keyboard controls would be good here. I also experienced problems trying to lock in a MIDI file and have it play back along with recorded sounds, but I'll keep trying. I know it's possible, because I've heard the results in some of the studios I hang around in. It is also possible to control the on-screen faders and other buttons via an external MIDI device or MIDI-equipped mixer by using the MIDI Map function, and maybe this is more advisable than trying to use the mouse.

These considerations aside, the sound is perfect — CD-quality stereo —and is extremely easy to access and manipulate.

The Bottom Line

If you're interested in quality synthesizing without the serpentine mess of wires and cables, MacProteus is for you.

If you're looking for a high-quality, multitrack-recording and -mastering device, Deck will fill the bill. The final recording/mixing/mastering process has always been the weakest link in the home studio; Deck solves this problem.

— Ken Gruberman

Get Info

MacProteus

★★★★½

Manufactured by: Digidesign, 1360 Willow Road, Suite 101, Menlo Park, CA 94025; (415) 688-0600.
Version: 1.0f2.
List Price: $895.

Deck

★★★★

Published by: Digidesign, 1360 Willow Road, Suite 101, Menlo Park, CA 94025; (415) 688-0600.
Version: 1.0.
List Price: $349.

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MediaManager,™ Mirror's exclusive disk management utility, lets you format and partition your drive into multiple volumes, and add password protection to each. Its Drive Spanning* feature allows several drives to be viewed as one contiguous volume. In other words, two 650Mb drives can be turned into one 1.3Gb volume!



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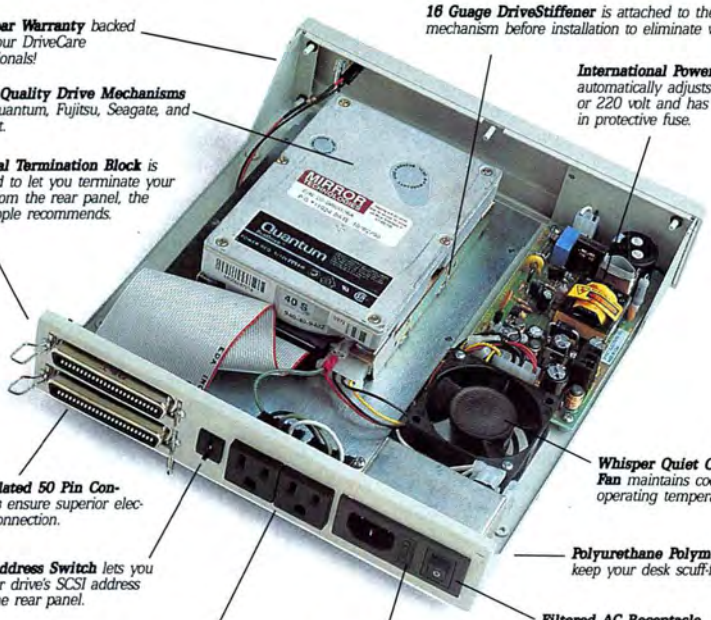
VolumeBackup's sophisticated scripting feature lets you create custom backup procedures that automatically back up your data when it's most convenient (like when you sleep). Back up to floppies, tape, another drive, or a SyQuest cartridge.

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With every drive, we're including a collection of over a dozen CE Software utilities that includes QuicKeys Lite, DiskTop, MockPackage, Aask, and Vaccine. And we've included Microlytic's GoFer, a high-speed text search and retrieval utility, and Inside Information, the first hierarchical dictionary for the Macintosh. Several of these wonderful utilities received MacUser Eddy awards and MacGuide Golden Gavel awards.



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M80(s)	80Mb	$427	$ 467
M80(q)	80Mb	$587	$ 637
M90(f)	90Mb	$497	$ 547
M105(q)	105Mb	$637	$ 687
M130(f)	130Mb	$647	$ 747
M180(f)	180Mb	$767	$ 877
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(s) = Seagate, (f) = Fujitsu, (q) = Quantum

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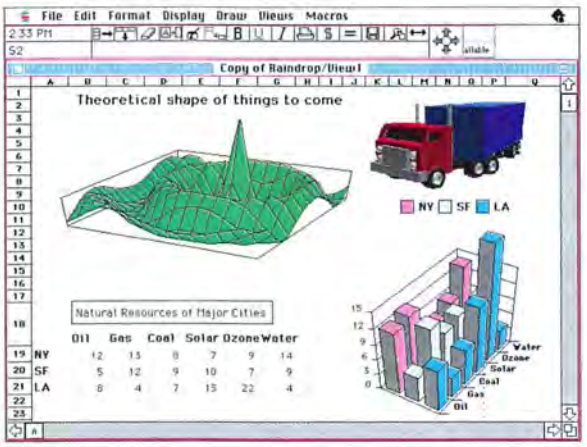
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SPREADSHEETS

Full Impact 2.0

When it comes to ease of learning and visual presentation, Full Impact exceeds Excel.



Full Impact 2.0's graphics capabilities put Excel to shame. Full Impact now offers 3-D surface and bar charts as well as the ability to import color PICT graphics, such as the truck at upper right, which was copied from Paracomp's SwivelArt. The graphs and the truck can be made into buttons that can activate macros.

Full Impact 2.0, from Ashton-Tate, is the first spreadsheet program that can directly import and export files in Excel format without going through an intermediate format such as SYLK. Full Impact now imports files (including function commands) from Excel 1.5 and 2.2 and exports files directly to Excel 2.2. Compatibility with Excel is reflected in other ways too, including keyboard commands and equivalent-function capabilities. But Full Impact 2.0 goes beyond Excel with some new features, including 3-D graphics, 32-bit color, custom data formats, programmable buttons, and improved presentation capabilities.

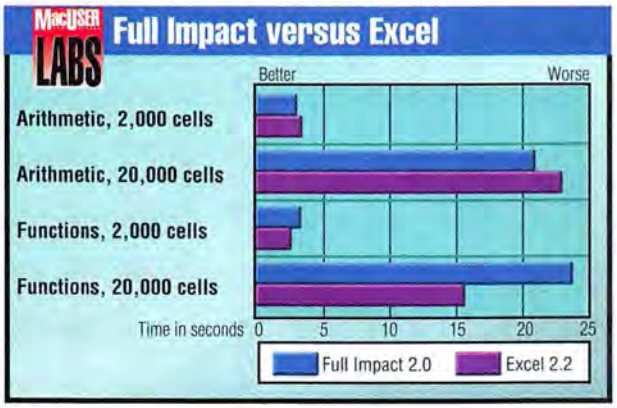
Contending with Excel

Full Impact is easier to use than Excel but is easiest to learn if you've never used the latter program. Full Impact's menu commands, for example, are more accessible than menu commands in Excel, which often conceals them in nested dialog boxes. Creating and changing charts is also much easier in Full Impact. But Excel users won't feel completely abandoned, because Full Impact 2.0 includes more of Excel's keyboard commands — such as Fill Right and Fill Down — than its predecessor contained. In addition, the new Custom Keys command, which is located on the File menu, lets you modify keyboard command equivalents or create new ones.

To provide even more functions, Ashton-Tate created the Extended Function Pack, which installs into your copy of Full Impact 2.0 (extended functions include operations such as Transpose and Lookup). It adds 50 new functions to the Functions menu, giving you most of those found in Excel plus some that Excel doesn't have.

Overall, these functions translate very well between the two spreadsheet programs. A Full Impact file saved in Excel format appears on the desktop as an Excel icon and is in almost every way a real Excel file. Each program still contains a few functions that do not translate and are imported as text, but most of the common functions can work in either program. One notable exception that's not translated is Excel's mathematical function *LOG*, which must be manually changed to *Log* when translated to Full Impact.

The drawback to using extended functions is that they are much slower than Full Impact's native functions. For the most part, Full Impact matches Excel's performance. Full Impact proved to be slightly faster than Excel for arithmetic calculations and slightly slower for functions. Extended functions cause a tenfold increase in the recalculation times in the chart — more than 3.5 minutes for a complex 20,000-cell recalculation that takes Excel only 15 seconds!



Although Full Impact 2.0 is slightly faster than Excel is at ordinary math, it is slower when recalculating spreadsheets that use only functions. When extended functions were used, Full Impact took ten times as long as Excel to compute the 20,000-cell test.

Painless Charting

Charting in Full Impact has always been easier and more versatile than in Excel. Graphs are created in one step, appear right on the spreadsheet, and can be moved around or resized anywhere on it. Updating charts is also easier than in Excel.

Charting in version 2.0 has been improved with new chart types and presentation enhancements. The 3-D views for bar, stacked-bar, and surface charts work better than in some plotting programs. To change the perspective, just grab a corner and rotate the plot. You can now also overlay two charts of different types, a feature Excel has had for some time.

Full Impact also excels in presentation features. A page-layout screen contains rulers and margins. The Draw menu contains tools for several shapes and for text blocks independent of cells that can be moved around the spreadsheet like graphics.

You can now customize data formats and have them appear on the Format menu. Formats can be used for chart labels and can include color changes for different values. Full Impact now supports 32-bit color, and 32-bit-color PICT images can be pasted into spreadsheets.

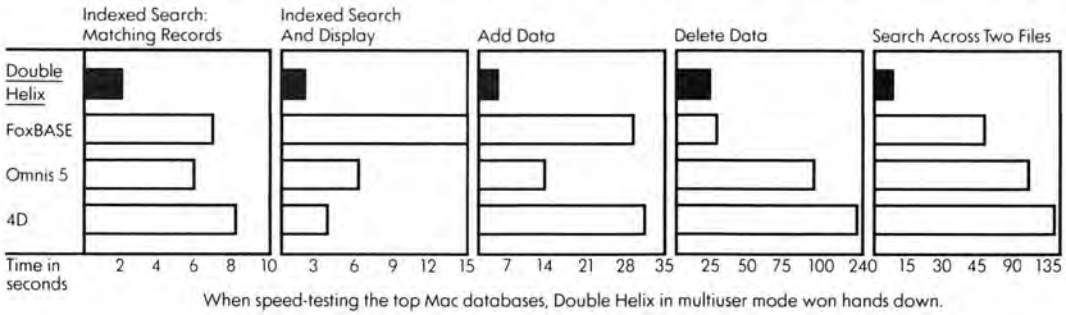
Paragraphs, imported graphics, or any graphic object can be used as a button to activate a macro written in FullTalk, Full Impact's powerful macro language. Although you could previously use FullTalk to completely customize a spreadsheet, the new button capability greatly aids in

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Since we know you're pressed for time, we'll skip the standard introduction and get straight to the point.

■ Double Helix is the fastest multiuser relational database for the Macintosh. This, you should know, is not our personal assessment, but rather the conclusive results of MacUser magazine's June 1990 speed-test. And of the four top databases, in five key commands, Double Helix finished first. By considerable margins.



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■ By the way, and for the record, we were the first ever to introduce a Mac-based client/server. And while it was revolutionary at its debut in 1986, it is, remarkably enough, still revolutionary today.

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Double Helix

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the creation of new data-management applications. Another powerful feature of FullTalk is its equivalent to HyperCard's XCMDs, which can be used to invoke subroutines in other programming languages. FullTalk has been further strengthened with 20 new commands, and it has the ability to find and replace function text in the macro script.

One of Full Impact's drawbacks was the amount of RAM it required, but Excel has almost caught up as a memory hog. Excel 2.2 takes 1,024K, and Full Impact 2.0 uses 1,280K. Full Impact, however, has its own virtual-memory implementation, which uses the hard disk to store infrequently used data when it runs out of RAM. This feature lets Full Impact spreadsheets fill more cells (up to 524,288) than any other Mac spreadsheet program, even though the maximum spreadsheet dimensions (256 columns by 2,048 rows) are considerably smaller than Excel's.

This upgrade has shrunk file sizes, which naturally benefits large files the most. A single-cell spreadsheet consumes 5K in Excel and 23K in Full Impact, but a 20,000-cell spreadsheet fills 392K in Full Impact whereas Excel requires 666K.

The Bottom Line

Ashton-Tate has done a good job of cleaning up Full Impact's deficiencies and improving its advantages. If you need to use the Extended Function Pack for most of your spreadsheet work and your spreadsheets are large, however, Excel is still the best bet. But if you do a lot of charts or want to use a spreadsheet for presentations, Full Impact is the clear choice over Excel. I'd also pick Full Impact for developing in-house applications and macros. The best point is that with Full Impact's Excel-import and -export capabilities, there is no longer any risk of being stranded between the two programs.

— John Rizzo

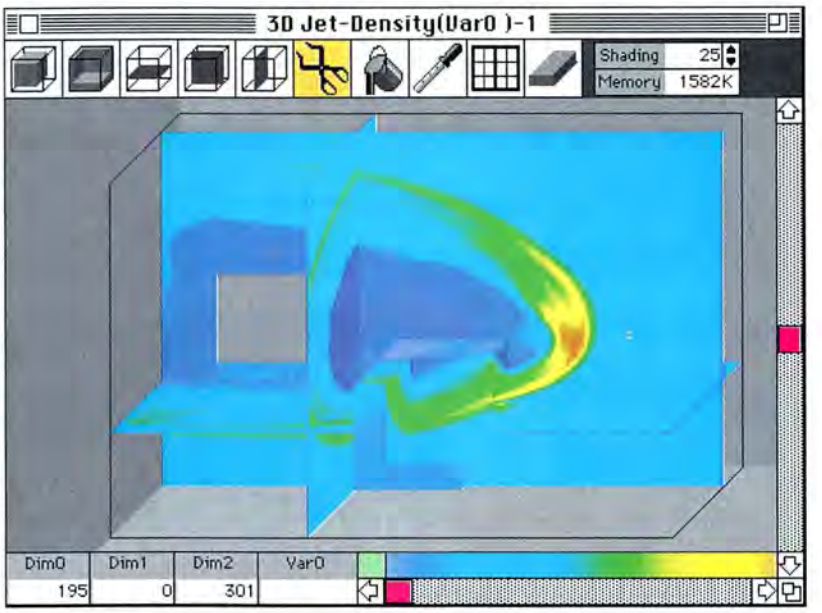
Get Info

Full Impact 2.0
★★★★½
Published by: Ashton-Tate, 20101 Hamilton Avenue, Torrance, CA 90509; (213) 329-8000.
Version: 2.0.
List Price: $295.

DATA ANALYSIS

Spyglass Dicer

Spyglass' 3-D visualization tool is weaker than its predecessors.



Spyglass Dicer lets you view and dissect data in 3-D. Here, three planes and a data cube display a supersonic jet within the possible data volume. Cutouts have been used to peek inside the cube and to cut a hole in the vertical facing wall.

Scientists and engineers employing supercomputers usually see their results as reams of numbers. Well, now these folks have a friend for visualizing their data on the Mac: Spyglass Dicer. Dicer is the third in a set of four packages promised by the Spyglass people, and although it's useful, it's unfortunately the weakest of the lot so far.

Cutting Up

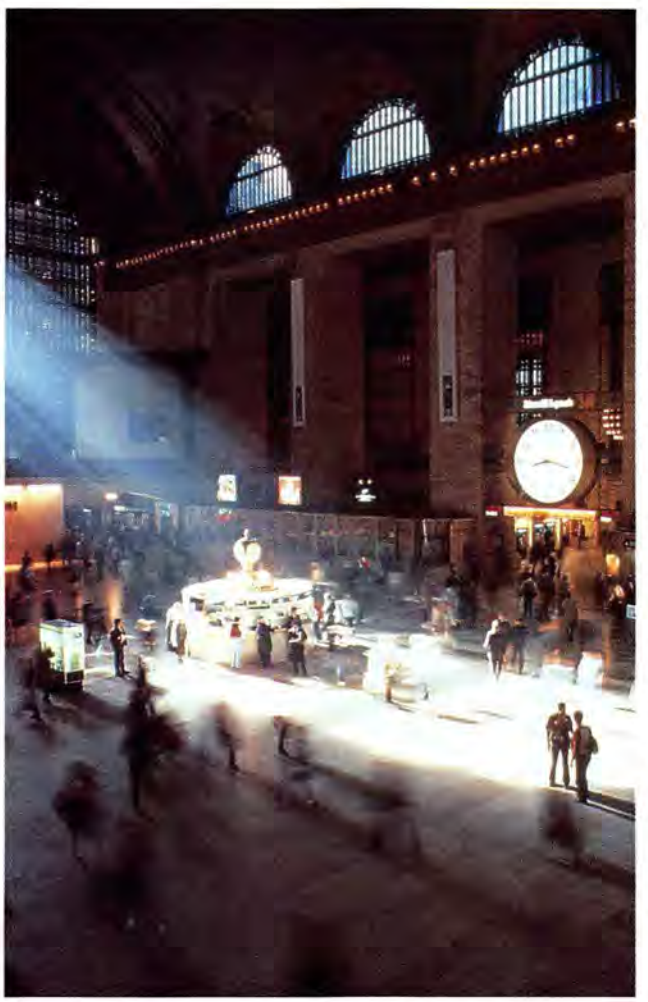
The first two programs, Spyglass Transform and Spyglass View (see review, October '90, page 72), allow the import, display, and manipulation of data in one- or two-dimensional arrays. Dicer takes the next step by supplying tools for viewing 3-D data. This can be data that varies in three spatial dimensions (*x*, *y*, and *z*) or data that varies with time (or any other independent variable).

Your first task when you use Dicer is to have your data in a format it can read. Its native format, called HDF (Hierarchical Data Format), is a public-domain format for storing data and images, invented by the people at NCSA (the National Center for Supercomputing Applications) at the University of Illinois, Urbana-Champaign. Spyglass also supplies MPW C 3.1 and FORTRAN libraries that you can use to put your data into the correct format. Dicer can import raw binary data (in byte, short-integer, long-integer, floating-point, and double-precision floating-point formats), but you still must order the data correctly and tell Dicer the dimensions of your array. The program also reads a format called netCDF.

Once you've entered your data into Dicer, the program presents you with a graphic of an empty rectangular solid (resembling the corner of an empty room), which represents the volume of your data. Your job is to decide where within this space you want your data displayed and in what colors.

Dicer gives you six tools with which to display your data. Three of them display flat planes or slices through your data (in the *x*, *y*, or *z* planes). The data-cube tool lets you define a rectangular solid within

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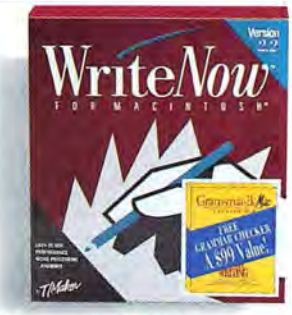
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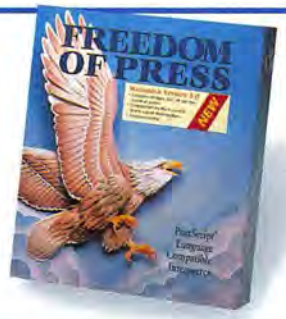
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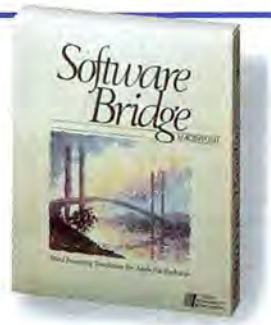
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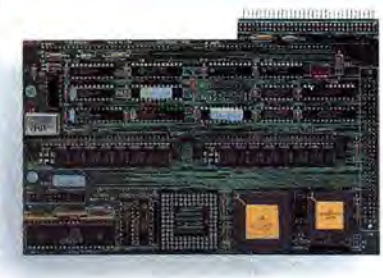
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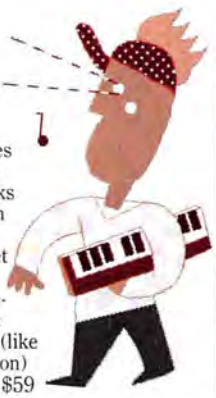
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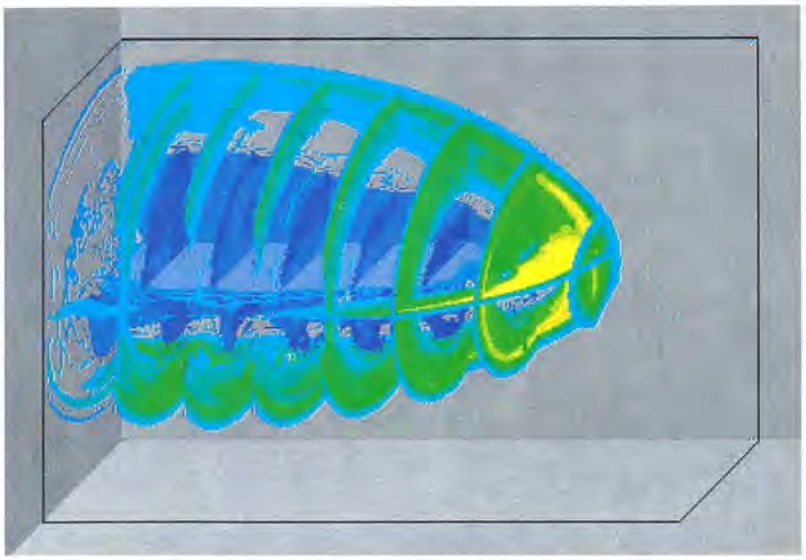
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Here is the same data rendered with many data slices and with Dicer's Transparency function turned on. Erased colors become clear, letting you focus on specific data values.

the data. The cutout tool lets you define rectangular-solid holes where data is *not* displayed and lets you cut corners from data cubes to see what's inside. You can also use cutouts to make holes in data slices. Data cubes, cutouts, and slices can intersect to make complex data displays.

Because you're working on a 2-D screen, creating 3-D rectangular solids is a two-step process. First you define a rectangular region, and then by pressing a key on the numeric keypad, you specify the direction in which you want to stretch the rectangle (left, right, up, down, in, or out). After you've stretched the rectangle into a solid, you release the mouse button and the program renders your data cube with colorful data covering its surface. The size of cutouts is defined in the same way data cubes are.

The sixth tool, the tongs, lets you grab, move, or stretch your data slices, cubes, and cutouts. With this tool, you move a data slice or cube (or cutout) by selecting it first (by clicking on it) and then grabbing an edge. The tongs close to let you know you've gotten ahold of the object. Just as in creating the data cube, you use the numeric keypad to govern the direction of movement — to stretch an object, you grab it by a corner and use the keypad to select the direction.

It's obviously difficult to select a cutout (a missing piece), so you have to select *all* the visible objects and then select Negate All Selections from the menu to select the cutouts. You can also click on the inside face of a data-cube cutout to select the cutout rather than the data cube. This is quite awkward, and I hope Spyglass will rethink its selection methods.

If you like the shapes you've created and want to use them to view another set of data, you can copy them to another data set, scaling the shapes to fit the data.

Dicer has 17 built-in color tables and lets you import those you've built with other Spyglass products. You can also redesign the current table with the paint tool. One unique tool lets you declare certain colors transparent. You do this by painting them out either in the data view or on the color-table display near the bottom of the window. When you select Transparency from the Paint menu, these colors disappear from the data view and you can see through the volume they previously occupied. This is definitely one of the more exciting features of the product.

Snake Eyes

Although Dicer works as advertised, it has some disturbing problems that need to be addressed.

First and foremost, it occasionally crashes, although I couldn't determine any reproducible causes.

The supplied demo image doesn't match the tutorial image in the manual, and the tutorial itself jumps around and assumes that different objects are on the screen from those you have if you follow the tutorial in a linear manner.

When Dicer plots data, it normalizes the original numbers in order to fit the

256 possible colors. Unfortunately, it loses track of the data element's original value, so when you point to a place on the screen, you get a value between 0 and 255, *not* the original value! This derived number is fairly useless.

The program lacks a magnifying-glass tool. You can specify a magnification only when you first bring in the data. The method is awkwardly implemented in a dialog box and offers magnification only in powers of 2.

Although there is a way to rotate a cube and view it from different angles, you almost need a Ph.D. to figure out the dialog box and even then you can rotate the cube only in 90-degree increments. You should be able to grab a cube and arbitrarily rotate it. Spyglass should look at a few 3-D-modeling packages.

There is no way to make oblique slices, which could be important if you plot data that exhibits nonorthogonal phenomena.

There is no facility for animation (although Spyglass does recommend an extremely awkward method for crude animation). This is odd, because Spyglass' other packages support animation.

Although you can copy images to the Clipboard, there is no way to save them to a PICT file (or any other format). As a matter of fact, the File menu has no Save command at all, so when you quit Dicer, you lose all your work.

The Bottom Line

Like Spyglass' previous packages, Dicer is a powerful program that lets you visualize data in many ways. Unlike Transform and View, though, Dicer never was a public-domain package available from the NCSA. Perhaps if it had been, the folks at Spyglass would have had the user feedback they needed to smooth the program's rough edges. [*At press time, Spyglass said that Dicer version 1.1, which will save, should ship this spring. — Ed.*]

— Ron Hipschman

Get Info

Spyglass Dicer

★★½

Published by: Spyglass, 701 Devonshire Drive, C-17, Champaign, IL 61820; (217) 355-1665.

Version: 1.0.

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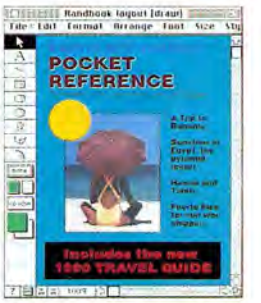
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Among the currently available personal-scheduling programs, the hottest competition is shaping up between a major upgrade to JAM Software's original classic, Smart Alarms with Appointment Diary, and a new entry from CE Software, Alarming Events. They're closely matched, but CE's product just barely noses out Smart Alarms.

Smart Alarms

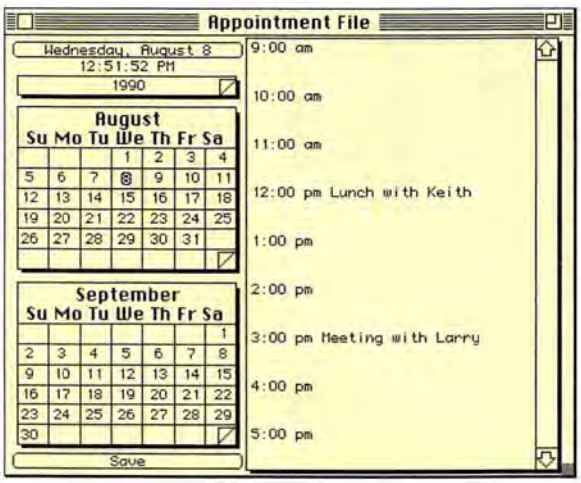
Smart Alarms 3.0 is an INIT that acts as a DA. Unlike earlier versions, it has no special installation procedures and no copy protection. All of Smart Alarms' functions are accessed from a single dialog box. To create a reminder, simply set the desired time (much as you would with Apple's Alarm Clock DA) and write the desired message. Either at the scheduled time or at a desired advance time, Smart Alarms alerts you to the impending appointment. Additionally, recurring appointments can be set to occur at any specified interval (weekly, for example) or at a specific time of the month (the last Friday of each month). These notifications occur no matter what application you are using — even if Smart Alarms is currently closed. If you don't want to be notified, you can temporarily turn Smart Alarms off or even tell it not to notify you when you're using certain applications.

Smart Alarms comes packaged with another DA, Appointment Diary, the computer equivalent of the traditional calendar date book. Clicking on any date displays an editable appointment listing. Each day's listing area is initially blank — even times must be entered. However, once you've created a general layout (listing times at hourly intervals, for instance), it can be saved as a template for future days. Appointment Diary can also display entries in weekly or monthly views. Although Appointment Diary has no alarm functions, entries can be transferred to Smart Alarms with one simple command. This is strictly a one-way street, however, because entries made in Smart Alarms cannot be transferred back to the Appointment Diary. Even worse, there is no hot link between the two modules — any change or deletion in one module does not alter the corresponding entry in the other.

For network users, a multiuser version of Appointment Diary is available at an additional cost. More than simply allowing multiple diaries, it allows simultaneous access to the same Diary file by more than one user (although only one user can make changes to the file at a time). Unfortunately, a nonnetworked single user who simply wants to maintain more than one diary cannot do so without purchasing the multiuser version.



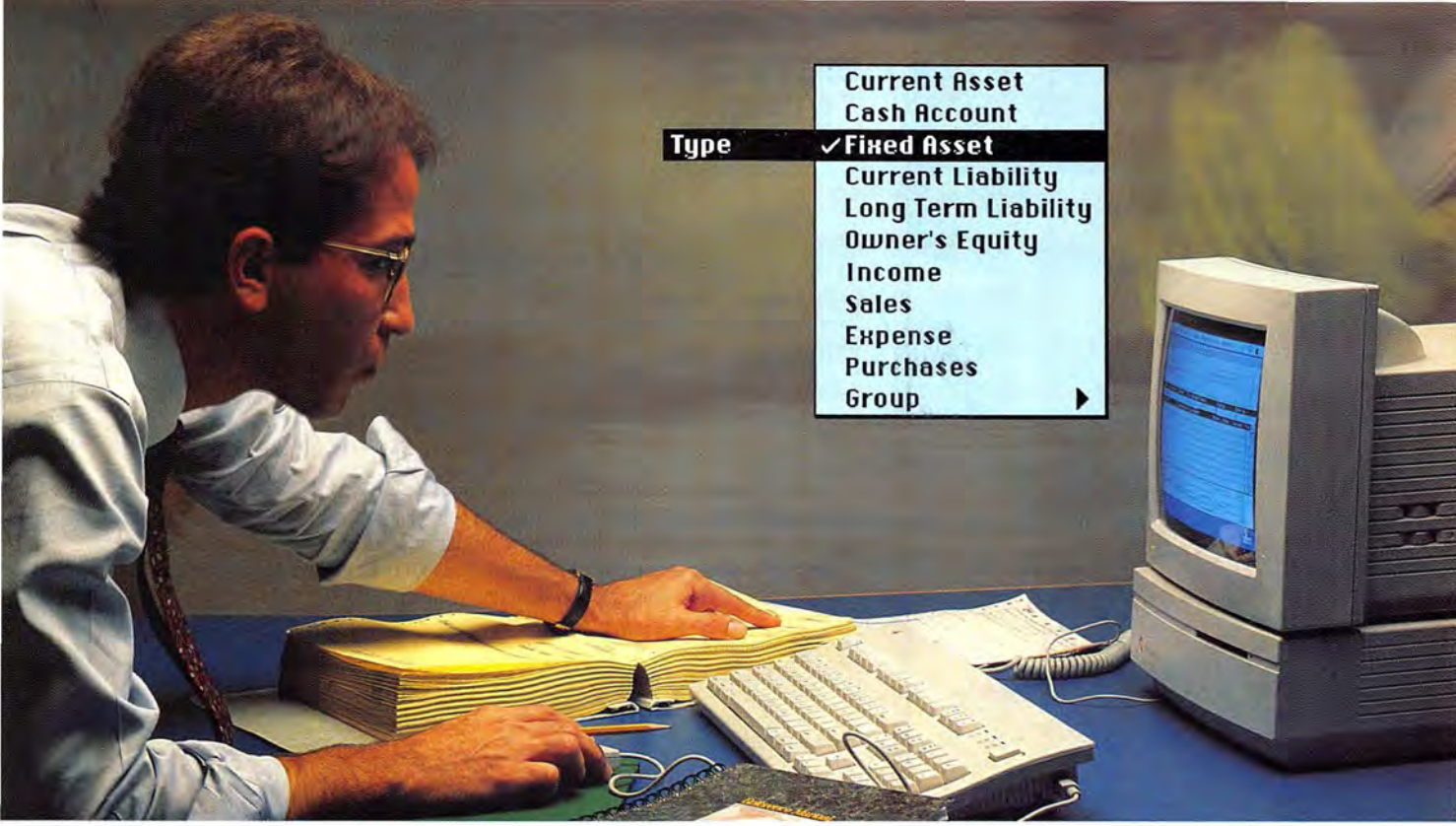
Smart Alarms is an electronic appointment calendar. You can create, view, and edit your reminders in its main dialog box. Goodies is a pop-up Options menu. Unfortunately, your Appointment Diary is another file that isn't linked to the Smart Alarms INIT.



Smart Alarms' Appointment Diary is a separate DA. The times listed in the area to the right can either be typed manually or created with an Auto Layout command. Clicking on any other day shows the appointments for that day. Changing an appointment here, however, does not change Smart Alarms' notification.

Alarming Events

Alarming Events has most of the basic features of Smart Alarms/Appointment Diary. The most prominent difference is that Alarming Events integrates the functions of Smart Alarms and Appointment Diary into one module. Alarming Events opens with a calendar view, in which clicking on any day opens a separate window with that day's schedule of events. A five-day view is also available. You use a pop-up menu to designate how you want each event to be treated (as an alarm that notifies you at the scheduled time, an appointment with no alarm notification, or even a "to do" listing that automatically carries over into the next day until you list it as "done"). Much like Smart Alarms, Alarming Events has advance-notification and recurring-interval capabilities. Additionally, you can set the expected duration of an event, which can help you avoid overlapping appointments.



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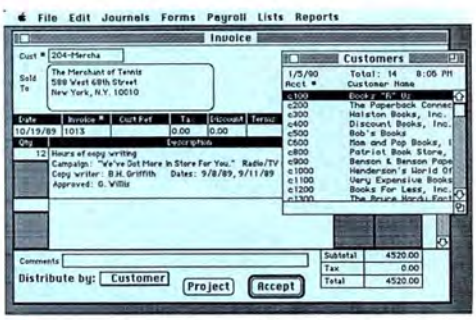
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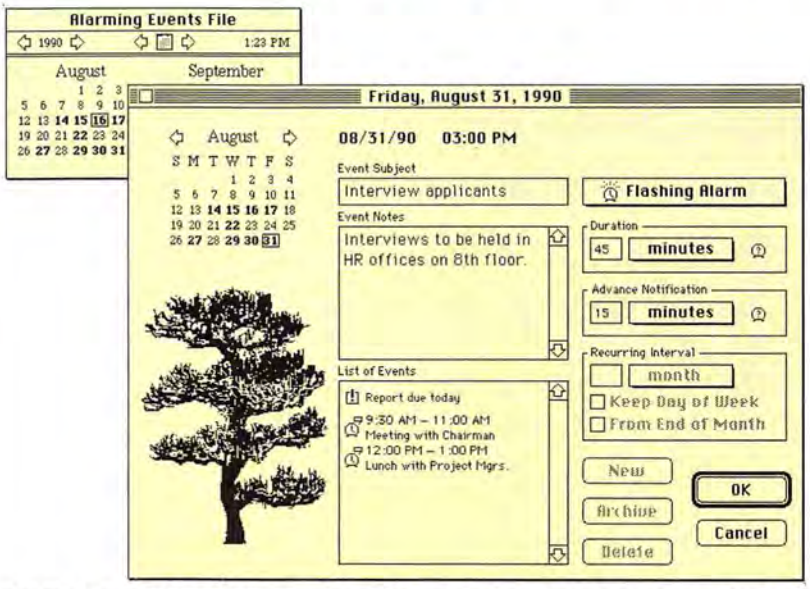
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Alarming Events' reminder dialog box can be set to pop up and alert you to an appointment. Note the row of icon buttons; depending on which one you click on, you can choose to postpone the message, mark it as completed, save it to an archive file, trash it, or transfer it to Alarming Events' main window for further editing.



You can create, edit, and view all your appointments and alarms for a given day at one time in Alarming Events' main window. The Calendar display window in the background lets you switch quickly to another day or month and boldface any dates with appointments.

Alarming Events can maintain an archive file for saving information about past appointments. Appointments can be placed individually into the archive as they are completed. This is superior to the comparable feature in Smart Alarms, which requires a separate application and must transfer at least an entire day's events at once. Another advantage of Alarming Events is that it gives you a choice of discarding or retaining completed events — Smart Alarms always discards completed events automatically.

Alarming Events also avoids Smart Alarms' split into single-user and multiuser versions. With Alarming Events, an unlimited number of reminder and archive files can be created. Alarming Events can run on a file-sharing network, but it is not as well designed for multiuser access as is Smart Alarms.

One of the best features of Alarming Events is the row of icon buttons that appears in the alarm-notification window. Depending on which one you choose, you can postpone the notification for a specified interval, mark it as completed, archive it, trash it, or open Alarming Events to that item for further editing. In contrast, the options available in Smart Alarms are basically limited to either postponing notification or trashing the item.

Alarming Events and Smart Alarms share similar input/output capabilities. Both let you print schedules, import and export schedules to and from text files, and merge different reminder files into one file. Alarming Events can exchange files directly with CalendarMaker; Smart Alarms can format files, using the Cambridge Z88 MacLite protocol.

Both programs are relatively bug-free. Smart Alarms has an annoying habit, however, of sometimes not displaying the first reminder on the list, leaving a blank line instead. Alarming Events crashed once during testing, and its reminder file was irreparably damaged (making Smart Alarms' automatic backup feature seem suddenly more significant).

The Bottom Line

Either of these programs is superior to any of the competition (including Rendezvous and Comment). In deciding between them, I give the nod to Alarming Events, primarily because of its integrated approach, greater flexibility in dealing with reminders, and more attractively designed interface. However, there are times when I prefer Smart Alarms' single scrollable reminder list to Alarming Events' separate listing for each day.

If your work habits make using one of these programs practical, it's definitely an improvement over the traditional approach. The alarm capability alone can justify purchasing the program. If you have any doubts, just wait until the first time a notification appears on-screen to remind you of a meeting that you would otherwise have forgotten. After that, you'll never want to be without one of these programs again.

— Ted Landau

Get Info

Smart Alarms and Appointment Diary

★★★★

Published by: JAM Software, P.O. Box 1345, Point Reyes Station, CA 94956; (415) 663-1041.
Version: Smart Alarms, 3.0; Appointment Diary, 3.1.
List Price: Single-user version, $125; multiuser version, $249 (1 to 4 users); versions for additional numbers of users available at extra cost.

Alarming Events

★★★★½

Published by: CE Software, P.O. Box 65580, West Des Moines, IA 50265; (515) 224-1995.
Version: 1.0.
List Price: $129.95.

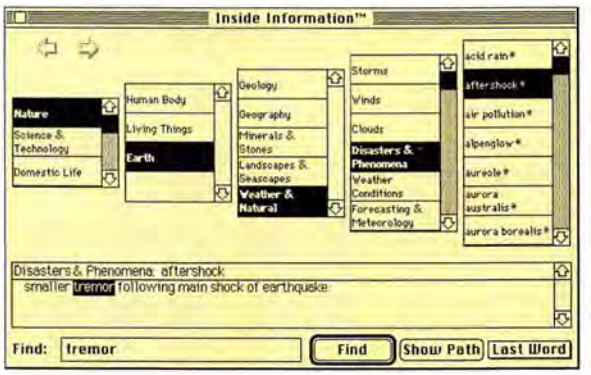


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WORD PROCESSING

Inside Information

Microlytics' hierarchical dictionary can get you started when you don't know where to look it up.



Inside Information lets you search for words hierarchically through categories rather than alphabetically. You have a choice of three views. Here, the graphic view shows the path to the word *aftershock*.

The number and variety of word-processing utilities keep growing at an alarming rate. There are spelling checkers, grammar checkers, dictionaries with definitions, and thesaurus dictionaries. To this expanding list, we must now add a new type of desk accessory from Microlytics: Inside Information, a hierarchical dictionary.

Close Relations

Fundamentally, Inside Information is a list of words, similar to a dictionary or a thesaurus. The words are not organized alphabetically, however, but by categories. At the root level are seven basic categories — for example, Nature, Arts & Entertainment, and Language. Each category branches into several layers of sublevels with multiple categories at each level. At the end of each pathway is a list of related words, usually accompanied by (very) brief definitions. For example, you can find the term *aftershock* via the following path: Nature, Earth, Weather & Natural Phenomena, Disasters & Phenomena, aftershock. The accompanying definition reads "smaller tremor following main shock of earthquake." You can also find some words through more than one path — for example, you can reach *aftershock* through Nature, Earth, Geology, Processes, aftershock.

Inside Information provides a choice of three views of the hierarchy: an outline view (in which you can expand and collapse headings), a tree view, and (my preference) a graphic view. The latter two display scrollable lists of categories for each level. The same features are available from all views, so which you use is basically a matter of preference.

If you want to find the pathway to or a definition of a particular word, you can type it in the Find box and request a search. You can then click on any word in the definition to continue with another search. For example, after locating *aftershock*, you can continue by clicking on the word *tremor*. This approach can sometimes lead to unexpected — and intriguing — results. As it turns out, *tremor* is listed not only as a mild form of earthquake but also as a human medical problem.

Inside Information is especially helpful in exploring for words within a subject when you don't know exactly what you want to find. For example, suppose you were writing a report about people who make films. By locating this path, you would get a surprisingly detailed list of filmmaking jobs, from the familiar (*screenwriter, director*) to the less familiar (*key grip, gaffer*) to the virtually unknown (*Foley artist, inbetweener*). This is distinctly different from a thesaurus, because the listed words, although related, are not synonyms.

To help you navigate through these listings, the program has a Last Word pop-up menu that returns you to any recently selected word. It can also create permanent "bookmarks" that remember any specified path.

Beyond all this, Inside Information contains a hidden gem: its Reverse Dictionary. Just type an approximate definition of any word you wish to find, and Inside Information displays a list of all the words that match the definition. This is the solution for all those times when the word you are looking for is on the tip of your tongue but refuses to come out.

Unfortunately, the Reverse Dictionary gem is more of a diamond in the rough than a polished jewel. For example, when I typed "small earthquake," it found *aftershock* but not *tremor*. This was because it listed *tremor* as a "mild" earthquake rather than a small one. Similarly, when I typed the phrase "wind storm," it located six matches but it missed obvious words such as *cyclone* and *tornado*, even though those words were in its database. On another occasion, when looking for *Caesarean section*, I typed a definition that included the word *surgery*. Inside Information found no matches. When I changed *surgery* to *surgical*, however, it correctly found the match. In short, the Reverse Dictionary works well only if you can second-guess how Inside Information's definition is phrased.

Inside Information also suffers from the limited size of its database. Although it requires five 800K disks to hold all its files, the word listings at the end of a path are often disappointingly brief. In many cases, definitions are not provided at all. The program cries out to be expanded and placed on a CD-ROM disc.

The Bottom Line

In its current form, I wouldn't use Inside Information often enough to justify its purchase. But that could change if Microlytics overcame the program's limitations. Although exploring its database can be interesting, Inside Information's practical value remains elusive. It has potential, but *potential* is another word for unfulfilled promise.

— Ted Landau

Get Info

Inside Information

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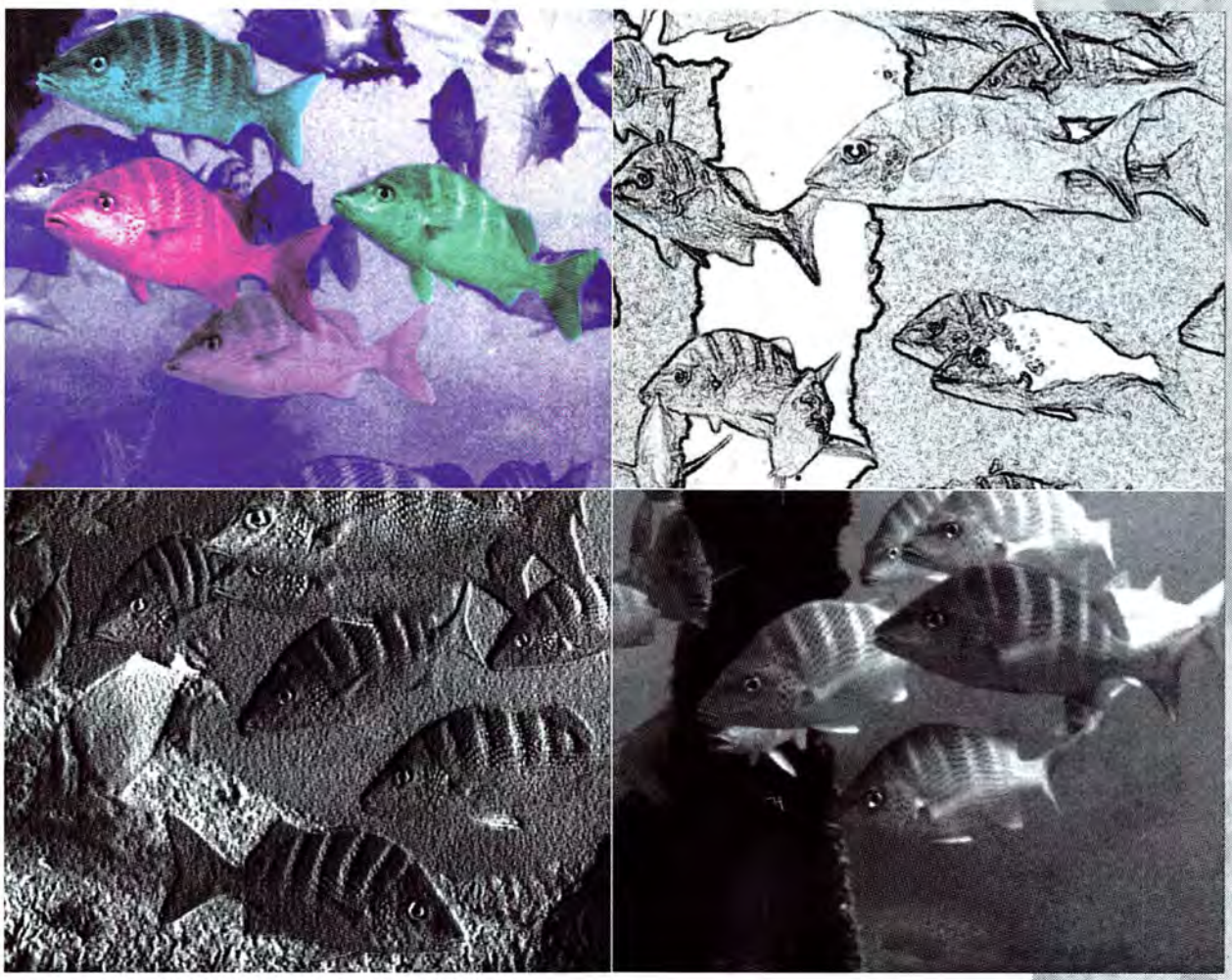
Published by: Microlytics, 2 Tobey Village Office Park, Pittsford, NY 14534; (800) 828-6293.
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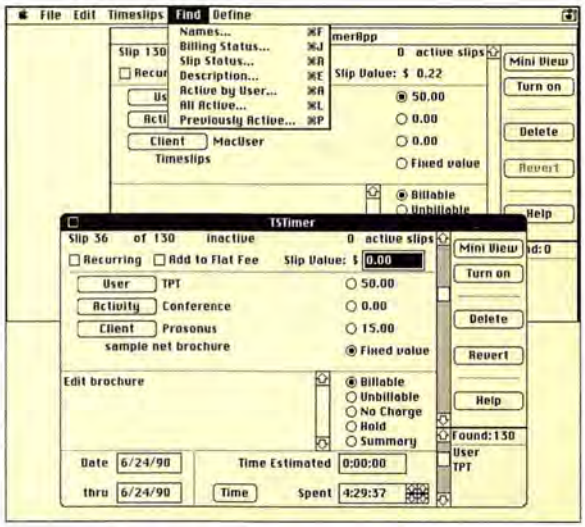
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BUSINESS ACCOUNTING

Timeslips III

Timeslips may make you more money, but your road to riches may not run smoothly.

Timeslips III turns time into money. The latest version of this popular time-billing package, which includes an application, a DA version of the application, and a report generator, boasts some additional power, but it's plagued by some annoying bugs.



Timeslips III is the latest version of a popular time-billing package. This version includes both an application and a DA (both of which are shown here). The program still has some bugs, but its biggest flaw is that Timeslips III doesn't warn you if you've turned off your Mac with a time slip running.

The Midas Touch

Timeslips achieves its alchemy by letting a single user or several networked users open a time slip and turn on the Macintosh's clock at the start of each activity performed for a particular client concerning a certain matter. While users toil, the clock ticks, and users who can type and work at the same time can enter a description for each slip. You can put a time slip into Expense mode to multiply unit costs by quantity. You can also manually batch-enter work done, time spent, and expenses incurred away from the office.

A time slip can add up billing costs, along with date and duration, using any of three preset methods: by comparing time actually spent on a project with that estimated, by adding time costs to a flat fee, and by describing the billing status of a block of time. A time slip also sports a beguiling Mini View button that shrinks the window and puts it wherever you last dragged it, letting you position it in a corner with only the grow box peeking onto the desktop.

Timeslips III also includes a DA version of the application for users who can't use the application under MultiFinder.

TSReport, the package's report generator, offers a set of reports that gives users, or watchful managers, an impressive and flexible number of formats for viewing the data accumulated on the users' time slips. TSReport can format and print invoices by time, project, or client; show client histories; track accounts receivable; age accounts and calculate interest on bills; summarize how a user spends time; export its data to a spreadsheet program or word processor; and generally be a great justification device when you're up for review.

For small-to-medium-sized businesses, Timeslips' ability to generate and track invoices and accounts receivable can be valuable. If you've been diligent about creating time slips during the month, you can easily set up detailed invoices by user, client, activity, and subject matter. Once you've printed the invoices, you can save them for later review. Telling Timeslips when an invoice is paid allows you to print automatic aging reports and print aging notices on subsequent invoices.

All Timeslips' reports can be printed in any font, and the invoice layouts are flexible in look, feel, and the level of information they present.

Slipping Up

Timeslips III does have a couple of drawbacks. Learning the drill of turning on a new time slip for each new activity and then quickly setting it up for client, matter, and activity takes a lot of practice. In the heat of an always-urgent client phone call, this can be distracting at the bottom of the learning curve, although it gets easier with use. On the other hand, remembering to turn a slip "off" for lunch, quitting time, or any of the day's ordinary distractions fouled things up even more. (A time slip can be open and "off," open and "on," or closed and off or on.) When I shut the Macintosh down with a time slip still on, I awoke to find I'd been accruing hours all night. The program should include an auto-off preference at shutdown.

The other difficulty I experienced was more disconcerting. When Timeslips' meter was running (whether or not the application or DA was open), the program conflicted with other Mac functions that used the serial ports or clock, costing me time in reboots and frustration. BackFax (admittedly not renowned for its predictability) often didn't work, and the Chooser occasionally lost contact with my laser printer until I turned off all my time slips or rebooted. I also experienced a notable increase in system crashes. After I called the support line, the company did provide an update, but it did not alleviate my system anomalies.

The Bottom Line

If Timeslips, the company, clears up some incompatibilities and adds some small ergonomic enhancements (for example, pop-up menus instead of layered dialog boxes), Timeslips, the program, could become a standard tool for contractors, managers, and employees. Whether or not it actually makes you more money, it can tell you and your clients how and where you spend your time.

— Tim Tully

Get Info

Timeslips III

★★★½

Published by: Timeslips, 239 Western Avenue, Essex, MA 01929; (800) 338-5314 or (508) 768-6100.
Version: 2.0e.
List Price: single-user version, $299.95; five-user network version, $699.95.

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PAGE LAYOUT

if:X Forms Designer

if:X takes a unique approach to forms design, but its initial version has some serious flaws.

Every so often, the trade-magazine pundits predict that business-forms software will be the next killer genre — just as soon as they figure out why anyone needs forms software in the first place. Softview's if:X Forms Designer takes a highly innovative approach to forms composition, but it suffers from far too many limitations and a steep learning curve.

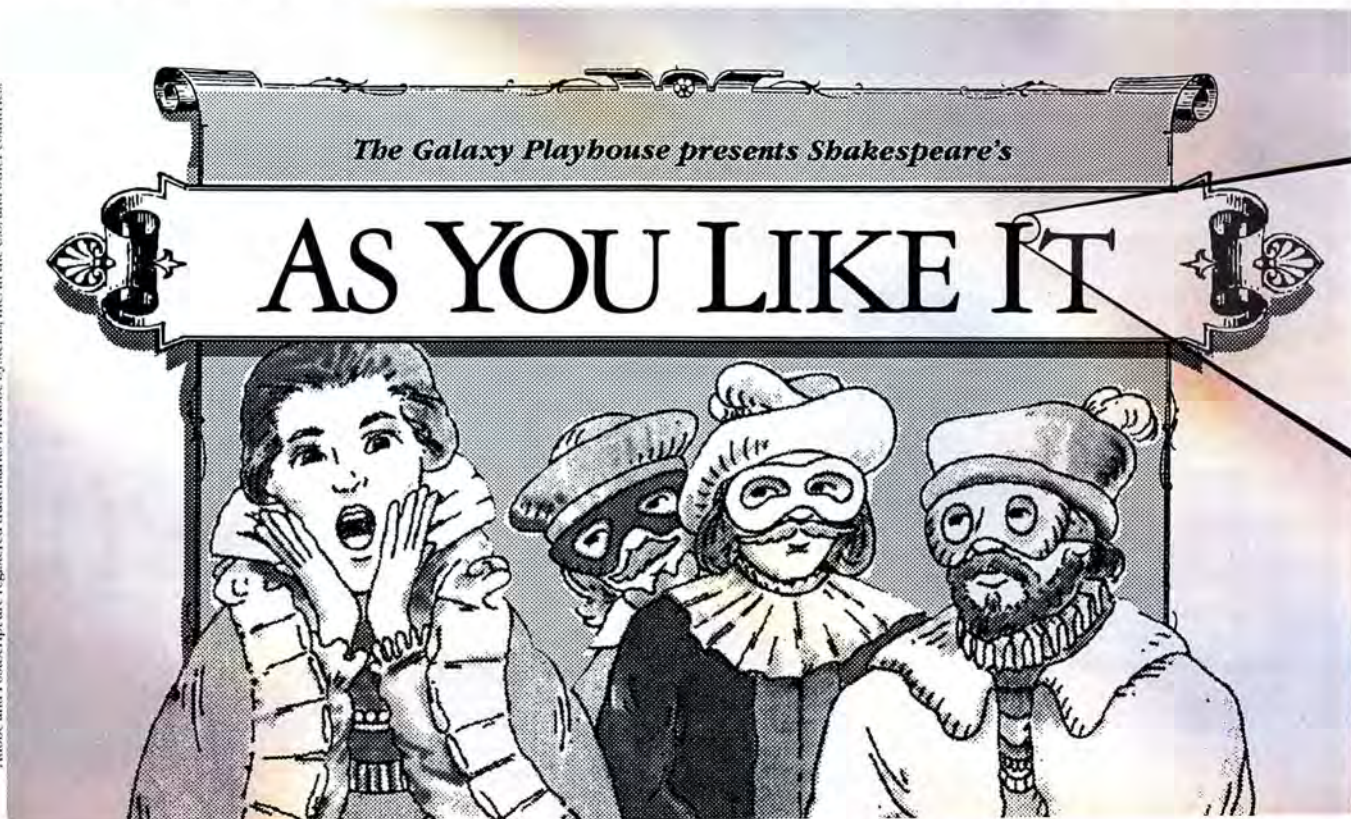
Innovation and Frustration

Softview (also the publisher of MacInTax) has approached its entry into forms composition with the assumption that the data-entry and data-processing legs of the forms triad are less important than the layout leg and can wait for a future release. Therefore, with if:X, Softview emphasizes graphics capability, apparently reasoning that people looking for forms software want it primarily for designing and producing custom business forms and that the big problem with other forms packages is that if the graphics are too laborious to compose at the outset, they are surely too time-consuming to edit and revise later on. To some extent, this is true, and if:X has some unique solutions to these particular problems. But if:X's solutions present daunting challenges of their own, and in the long run, if:X does not fully follow through in providing solutions to the myriad *other* problems posed by forms composition.

As a forms-drawing tool, if:X is both innovative and confounding. The initial composition screen presents you with a series of unfamiliar icons that have little in common with those of any of the popular desktop-publishing programs. Indeed, if:X has far more in common with spreadsheet programs: It assumes that a well-designed form can be broken down into a framework of cells and subcells, which again is true up to a point. But here if:X's strength is also its weakness, because the program has little flexibility for handling text and graphics formatting when the cellular analogy no longer applies.

In a real-world test, I tried to compose some forms and found almost invariably that when it was required to match an existing form designed by other means, if:X resisted every instinctive approach to many common design specifications. With enough research in Softview's very thorough documentation and with experimentation, I was usually able to find

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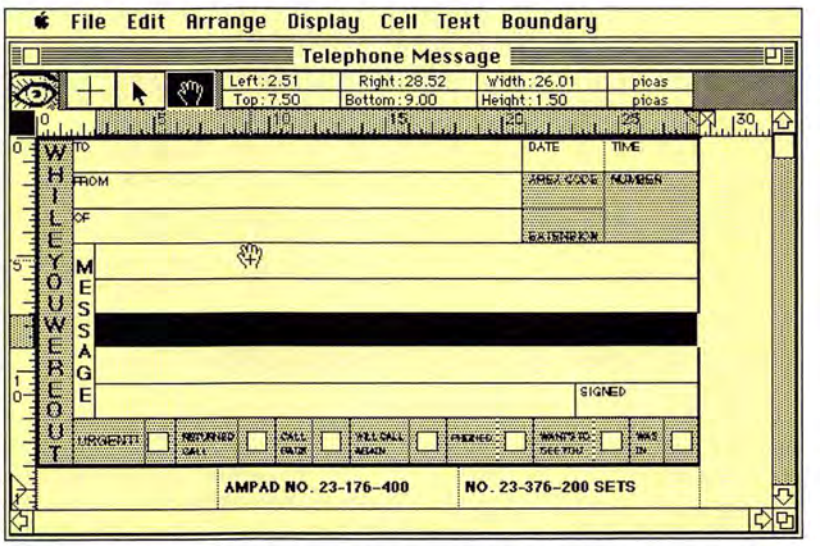
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the solutions and workarounds I needed, but it was difficult to remember the solutions and apply them to the next project. if:X's spreadsheetlike nature remained a difficult mental hurdle.

To compound the frustration, the screen interface is awkward to control; I found if:X ideal for generating an infinite number of horizontal lines, but I had great difficulty manipulating the dual-purpose ruling tool to produce vertical lines on the first try.

Forms Smarts

Nonetheless, if:X Forms Designer features several intriguing and unique concepts that deserve special attention, especially Softview's implementation of Graphics Intelligence, which means that every cell is aware of all the other cells that surround it and they all interactively react to edits and revisions. Make one cell larger or smaller, and the neighboring cells shrink or grow correspondingly. Delete a cell in a given row, and the adjacent cells move in to fill the vacuum.



if:X Forms Designer has a unique approach to forms design that takes some getting used to. For example, the tools in the palette work on a "first mouse direction" basis, so you often find yourself initially using the wrong tool and then having to undo your work and start again. In this form, a cell has been selected and the move tool (the hand) shows a cross to indicate that you can move the cell in any direction.

refine your characters.

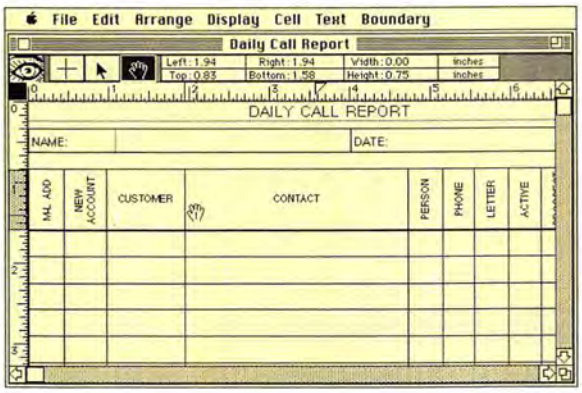


The HP LaserJet III printer delivers the most refined 300 dpi print quality ever. And it's easy to use. When configured with Adobe* PostScript* and AppleTalk interface, the LaserJet III is completely compatible with your Macintosh. All for only $3,700†.

HP offers other Macintosh compatible LaserJets. The new LaserJet IIID printer with increased paper-handling capability for $5,125†. And the affordable LaserJet IIP printer for only $2,595†. Call **1-800-752-0900, Ext. 1168** for the name of your nearest authorized HP dealer and ask for the Macintosh versions of the LaserJet line.

There is a better way.

HEWLETT PACKARD



if:X Forms Designer's biggest advantage is its Graphics Intelligence, which makes each cell aware of the other cells around it. Here the left border of the Contact column has been moved, and the other cells have stayed in proportion.

Take a square box containing several short lines of text, scale it down vertically and expand it horizontally, and it alters its text specifications to fit the new shape, yielding fewer but longer lines of text. (If nothing else, this feature could position if:X as an excellent chart- and table-composition environment.) Also, as with its popular MacInTax ancestor, you can change illegibly small type so you can view it at a larger size without actually altering the size specification when you print it out.

if:X also contains several other unique touches. For example, you can fine-tune leading and vertical alignment to accommodate uppercase and lowercase text with descenders or all-uppercase text with no descenders. You can insert a variety of styles of check boxes before or after any caption without performing meticulous rectangle drawing or font switching. You can reverse or resequence the contents of sequential text cells without laborious cutting and pasting; you can transpose the horizontal/vertical arrangement of a table in the same way.

Version 1.1 supports EPS-file exporting, but if:X can't import graphics files except through the Clipboard and you can't scale images in if:X Forms Designer.

The Bottom Line

For all its innovations, if:X has little built-in knowledge of forms-industry standards and assumes that you're interested in printing nothing more ambitious than flat sheets at standard laser-printer paper sizes. Multiple-part forms have a special disadvantage, because if:X files can be only one page long. You must create backers, additional plies, and part-to-part changes and store them in separate files. You can rotate text, but only in 90-degree increments. And there are no word-processing features to speak of; text-intensive form letters or exhaustive terms-and-conditions sections are best

With the HP ScanJet Plus, you've

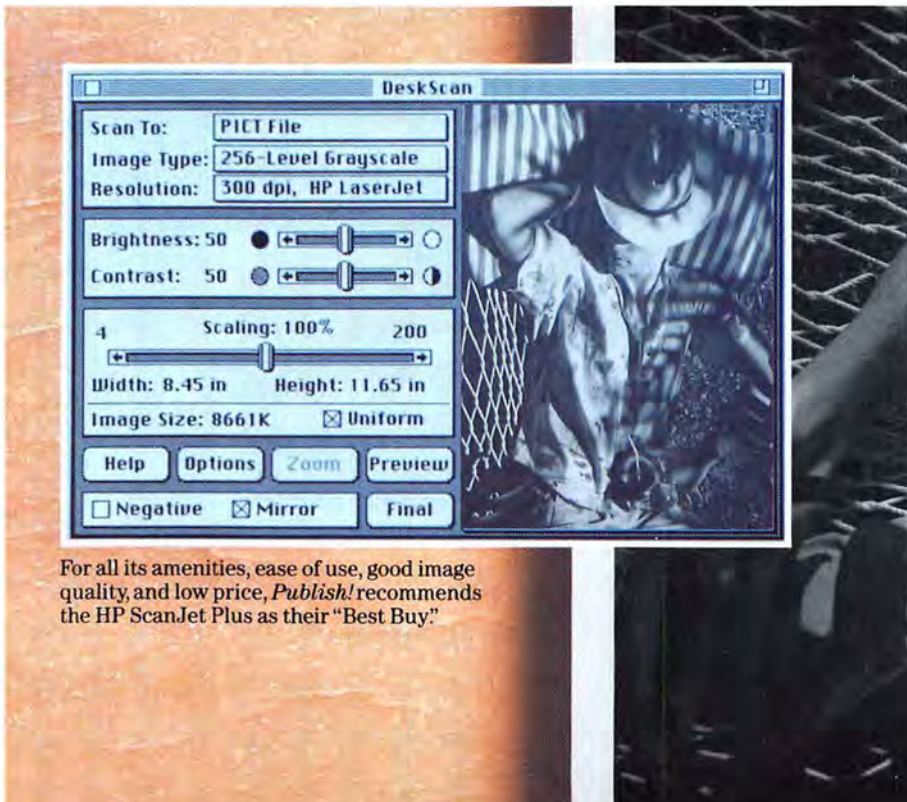
The HP ScanJet Plus scanner provides 8-bit photographic-quality scanning.

That means 256 shades of gray for the hottest-looking output from your Mac. And it's so easy, too. At the click of a mouse, you can get negative or mirror images, as well as scaling in 1% increments from 4-200%. All for $2,190,* about what you would expect to pay for a 4-bit scanner.

So if you want the richest, most detailed images from your Mac, you've got it made with Hewlett-Packard. Call **1-800-752-0900, Ext. 1005** for your authorized HP dealer.

There is a better way.

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For all its amenities, ease of use, good image quality, and low price, *Publish!* recommends the HP ScanJet Plus as their "Best Buy."

composed elsewhere. On the whole, its long learning curve makes if:X a difficult product to use when you're under a tight deadline.

Still, as a work in progress, if:X Forms Designer is a fascinating first step. With a less mysterious user interface and the addition of familiar drawing tools and text-handling conventions, it stands to become a viable contender for a market-place niche that's still waiting for an undisputed champion.

— Jay Zilber

Get Info

if:X Forms Designer

★★½

Published by: Softview, 1721 Pacific Avenue, Suite 100, Oxnard, CA 93033; (805) 385-5000.
Version: 1.1.
List Price: $279.

F3 Pro Designer

Without reservation, I can say that the best forms program to date is Bloc Development's DOS entry, F3 Pro Designer.

To be fair, F3 is in a somewhat different league from if:X. It is much more expensive ($995) and is not readily available in software outlets; Bloc prefers to direct-market to targeted forms manufacturers and large corporations. And as with any first release, it has problems that cannot be glossed over. But on the whole, F3 comes closer to the ideal than anything else in the less-than-$1,000 range.

Under development long before the introduction of Windows 3.0, Bloc uses its own proprietary graphics environment, which owes much to the familiar Macintosh interface. F3 is easy for novices to start with, because it is crammed with extensive preprogrammed knowledge of forms-industry construction standards and it guides you step by step through the creation of a customized composition field. The drawing tools are essentially descendants of those in the familiar MacDraw tool kit, but they have been substantially optimized for forms-composition requirements.

F3 files can comprise up to 32 pages, each of which can have both a front and a back side, and you can tag any text or rule element for color-separated mechanicals when you print them out. You can copy selected artwork from one page into another or edit it simultaneously on all sheets that have areas in common. Up to four files can be open simultaneously, and bit maps as well as EPS files can be imported and scaled on the fly. F3 also has a wide assortment of report-generating features that can create forms indexes and reports for in-house forms-management systems.

F3 provides three ways for you to enter text, including a simple point-and-place one-line-caption editor and a full-featured body-text editor that compares favorably with any entry-level word processor.

If F3 becomes available for the Mac, it may become the last word in forms composition. F3 has set the standard that Mac forms developers will have to beat.

got it made in the shades.



*Suggested U.S. list price. © 1990 Hewlett-Packard Company PE12004

WORD PROCESSING

Microsoft Word Utilities

Word is big and powerful, but that doesn't stop these packages from adding to it.

As shipped from Microsoft, Word is already a feature-packed program. But that doesn't mean its functionality can't be supplemented, as these four add-ons prove.

DocuComp

DocuComp isn't strictly a Word utility, because it also works with several other word processors. Its one function is simple: to compare different versions of the same document and show where differences exist. Two versions of the document are displayed in separate windows: The earlier version uses strike-through marks to indicate deleted text; the newer version uses underlines for all added text. Any text that has been moved is shown in boldface in both windows. You can change the exact marker (and even its color) if you wish. The Next Change button quickly advances you to the location of each succeeding change, with both windows automatically scrolling in a linked fashion. DocuComp ignores certain differences, such as changes in font and style, but otherwise picks up any difference, no matter how minor.

The program worked smoothly and without error in all my test runs. Text that has been both changed and moved can present a problem, but DocuComp generally handled it as I would have wanted.

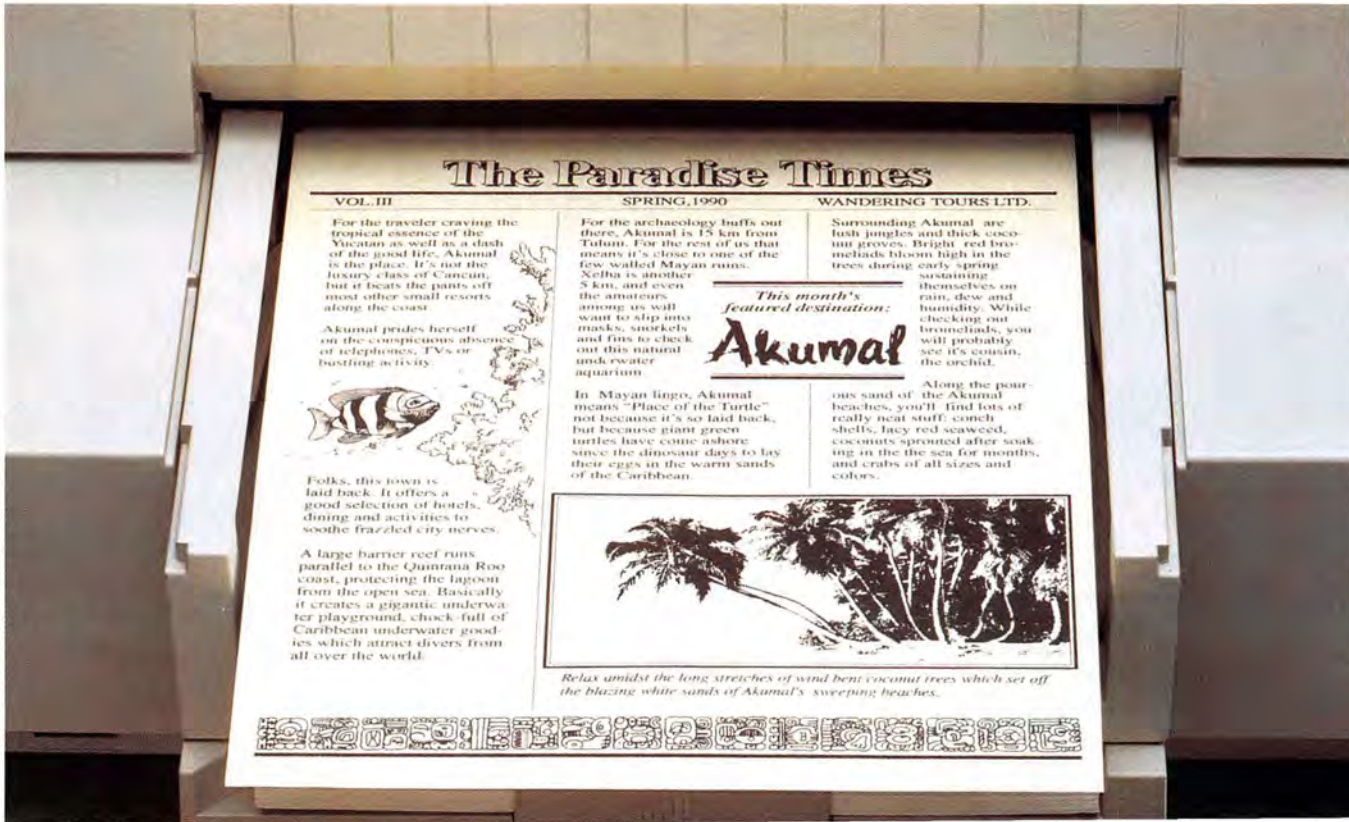
DocuComp can create a composite document that combines all the insertions and deletions from the two original documents. The composite document includes a summary of all changes that were made, including the page and line number of each change. My only complaint is that the composite document cannot be directly displayed on-screen from within DocuComp. You must either print it or save it to disk as a word-processor file.

Not every Word user needs DocuComp. But for any task that requires a clear indication of what changes have been made to a manuscript, DocuComp can be an invaluable time saver. For such tasks, it's a definite winner.

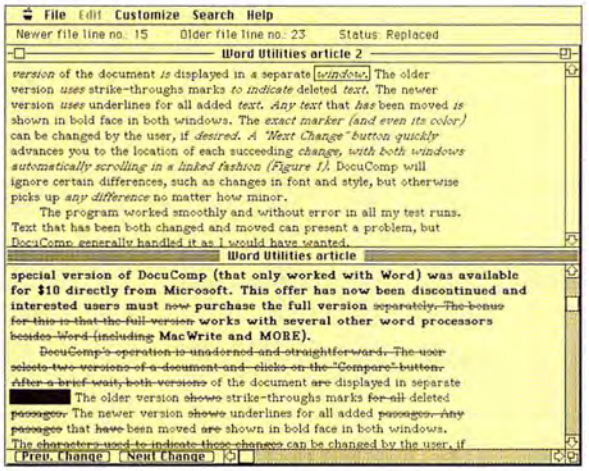
Stylist

Word's style sheets are incredibly powerful, but they can be confusing. Anyone who makes frequent use of them will appreciate Stylist. It tells you the characteristics of Word's style sheets so you can get a good idea of what each sheet does before you apply it. Whereas

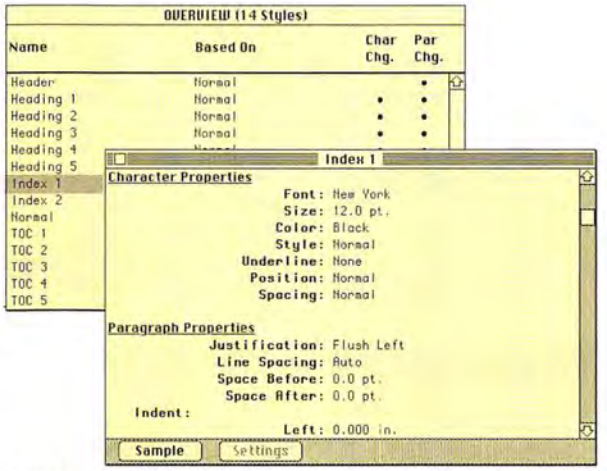
With the HP DeskWriter, you can



*Suggested U.S. list price. © 1990 Hewlett-Packard Company PE12005
Documents created using Microsoft® Word and Aldus PageMaker®.
Microsoft is a U.S. registered trademark of Microsoft Corp.
PageMaker is a U.S. registered trademark of Aldus Corporation.



DocuComp is *the* tool for comparing two versions of a document. The change indicators have been customized so that added text is indicated in blue italics and deleted text is indicated as green strike-through text.



Stylist makes Word's otherwise-arcane style sheets much clearer. The rear window gives a listing of all styles used in a document. The front window is a listing of all the formatting characteristics of the highlighted style.

Word provides only limited descriptions of the settings of a style (for example, Normal + Tab stops: 0.375in), Stylist gives a complete, unabbreviated description. Using MultiFinder, you can even access a document's styles while the document itself is open in Word, but you can't make any changes or additions to a style sheet from within Stylist, because

have it all. (But keep it to yourself.)



The HP DeskWriter printer puts laser-quality printing right at your fingertips.

With a small size and a $995* price tag, the DeskWriter printer easily fits on your desk and in your budget. And its advanced 300 dpi inkjet technology lets you print sparkling text and detailed graphics.

The DeskWriter is also designed for easy use with your Macintosh, and has both serial and Apple Talk interfaces. It even includes scalable and outline fonts. Combine that with the DeskWriter's whisper-quiet operation, and keeping it to yourself will be that much easier. So call **1-800-752-0900, Ext. 1004** for your authorized HP dealer.

There is a better way.

HEWLETT PACKARD

it's strictly a read-only program.

Even if you don't use Word's Styles function yourself, Stylist can still be valuable for when you need to decipher styles created by other users. Usually, the name someone else has picked for a style sheet tells you absolutely nothing. As a bonus, Stylist includes a set of predesigned style sheets of various formats (for résumés, for example) as well as a supplementary dictionary of computer terminology for use with Word's built-in spelling checker.

Tech Words

Speaking of dictionaries, a variety of specialized ones are available. For example, Geocomp's TechWords is a set of seven separate supplemental dictionaries for Word (another version is available for other word processors). The dictionaries cover scientific areas such as chemistry, physics, life sciences, and computer technology and can save a lot of time that you would otherwise spend tediously adding words relating to these areas to your user dictionaries.

Unless your use of technical words is extensive, however, the dictionaries probably represent a degree of overkill (and still might not include all the words you require). Depending on your hardware, adding dictionaries may slow down Word's spelling checker, which isn't quick to begin with. Finally, TechWords shares a problem that is common to all of Word's supplementary dictionaries: Word correctly identifies terms that are contained in a supplementary dictionary, but it doesn't list these terms as suggested alternatives for incorrectly spelled words.

Because of their similar purpose, I compared the computer-terminology dictionary included with Stylist with the TechWords version. Surprisingly, there was not much overlap between the two. TechWords' listing was much larger and more complete, but Stylist's was superior in its listing of words specific to Macintosh users. For example, Stylist's dictionary recognized the word *LaserWriter* whereas TechWords' did not.



Geocomp's TechWords is a set of Word supplementary dictionaries. This is the computer-terminology dictionary. Although it's extensive, it omits many words of particular relevance to Mac users — *LaserWriter*, for example.

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There is a better way.

HEWLETT PACKARD



Foreign-Language Dictionaries

A different approach is taken by Microsoft Word's own optional foreign-language dictionaries. The foreign-language dictionaries available are British, French, Spanish, German, Italian, Swedish, and Dutch. These dictionaries each act as replacements for the standard U.S. English dictionary, which means that, unlike with supplemental dictionaries, you cannot have two of these dictionaries open at the same time. Thus, to check a document that contains two languages (even if one language is English), you must check all sections of one language first, quit Microsoft Word, open it again with the other dictionary active, and then check the remaining passages.

I did not test these dictionaries for overall accuracy across long passages of text. However, I did use my passing knowledge of French and Spanish to try some specific cases. I was pleased to discover that they detected my intentional errors, including incorrect placement of accent marks and tildes.

The Bottom Line

Each of these four products largely succeeds at what it attempts to do. If the functions they provide are relevant to your particular use of Microsoft Word, you will almost certainly be pleased with them.

— Ted Landau

Get Info

DocuComp

★★★★½

Published by: Advanced Software, 1095 E. Duane Avenue, Suite 103, Sunnyvale, CA 94086; (408) 733-0745.
Version: 1.5.
List Price: $159.95.

Stylist

★★★★

Published by: SNA, P.O. Box 3662, Princeton, NJ 08543; (800) 628-6442.
Version: 1.0.
List Price: $79.95.

TechWords

★★★½

Published by: Geocomp, 66 Commonwealth Avenue, Concord, MA 01742; (508) 369-8304.
List Price: $79.

Microsoft Foreign-Language Dictionaries

★★★★

Published by: Microsoft, One Microsoft Way, Redmond, WA 98052; (206) 882-8080.
List Price: $75 each.



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INTROD
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Freedom of Press

★★★★½



Freedom of Press Light

★★★★½

FOP (Freedom of Press; see review, January '90, page 77), the software PostScript emulator, now comes in two editions: the full package and a new low-cost version called Freedom of Press Light. FOP Light has all the features of the more expensive program but supports fewer printers. Both packages support Adobe Type 1 fonts (including hints), almost any QuickDraw printer, and background printing.

FOP requires a Mac Plus or later, at least 2 megabytes of RAM, and 2 to 4 megabytes of hard-disk space. One note on the installation process: A ReadMe file implies that you have to install the EvE INIT provided on one of the distribution disks — you don't. It's required only for certain high-end printers and other devices that are mired in the EvE hardware copy-protection scheme.

There are two main changes in version 3.0. FOP now lets you print PostScript files directly from the applications that created them — if you're running under MultiFinder. FP Spooler is a small program that appears as an available LaserWriter in the Chooser. Once it's selected, whenever you click on Print in a program, FOP automatically creates the PostScript file and then sends it off to the printer.

The second addition to version 3.0 is support for Adobe Type 1 fonts via Adobe Type Manager. You can use Adobe fonts in your documents, and ATM and FOP can deal with them properly.

If your printer supports the new PostScript cartridges, you should probably use a cartridge rather than buying the $495 flagship version of FOP. I can see little reason for an owner of an HP LaserJet, for example, to prefer FOP over the HP PostScript cartridge, which offers true PostScript and costs only about $80 more than FOP. On the other hand, for those whose output device is a film recorder or a printer without cartridge capabilities, this version of Freedom of Press is by far the best PostScript clone on the market.

Freedom of Press Light supports fewer printers and comes with only the standard LaserWriter fonts (you still get full Adobe font support via ATM, however, so you aren't really restricted), but at $98, it's a true bargain. I'd highly recommend it to anyone on a shoestring budget who's looking for PostScript compatibility.

Custom Applications, Building 8, 900 Technology Park Drive, Billerica, MA 01821; (508) 667-8585. Version 3.0. Freedom of Press, $495 (includes LaserWriter Plus fonts); Freedom of Press Light, $98 (includes LaserWriter fonts).

— Gregory Wasson



UltraScript for the Macintosh

★★½

UltraScript from QMS, the printer manufacturer, is the only PostScript emulator that comes close to Freedom of Press — just how close is worth examination.

UltraScript works with a Macintosh Plus or later. You need at least 3 megabytes of RAM for optimal use and 6 megabytes of hard-disk space for processing PostScript documents for non-PostScript output devices.

An installer disk copies various components of UltraScript, including an INIT, to your hard disk during setup. Installation is similar to that of Freedom of Press.

Now for the bad news. UltraScript advertises Type 1 support, but there's a catch — you must convert all your Adobe printer fonts into a special QMS format with Convert, a utility that's packaged with UltraScript. This doubles the disk space you need for your Adobe fonts, assuming you want to keep the Adobe font files on-disk for use with ATM. The conversion process on 68000-based machines can take from 15 to 40 minutes per font (68020/30 machines take less than a minute). Converted versions of the standard LaserWriter fonts come with UltraScript. You can also buy the QMS version of the LaserWriter Plus fonts for $195.

Despite earlier reports of incompatibility with Suitcase II, the version I looked at (1.11) worked well with Suitcase-installed bit maps.

Aside from its clumsy approach to handling Type 1 fonts, UltraScript works reasonably well. In conjunction with a Chooser driver, it can operate in the background under MultiFinder, so you can print directly from applications with the Print command. Or you can create PostScript files with the usual Print/Command-K trick and then process the files — one at a time — in UltraScript. Unlike Freedom of Press, UltraScript does not permit batch processing.

Indirect support for Type 1 fonts prevents UltraScript from posing a serious threat to Freedom of Press. It's a serious flaw. And at $195, UltraScript offers fewer features and less printer/film recorder support than CAI's new $98 Freedom of Press Light. UltraScript does a good job and may develop into a superior product, but right now, Freedom of Press is still the champ.

QMS, Software Products, P.O. Box 58101, Santa Clara, CA 95052; (800) 635-3997 or (408) 986-9400. Version 1.11. $195; UltraScript Plus, $495 (includes a network spooler and 43 fonts).

— Gregory Wasson



Cheshire

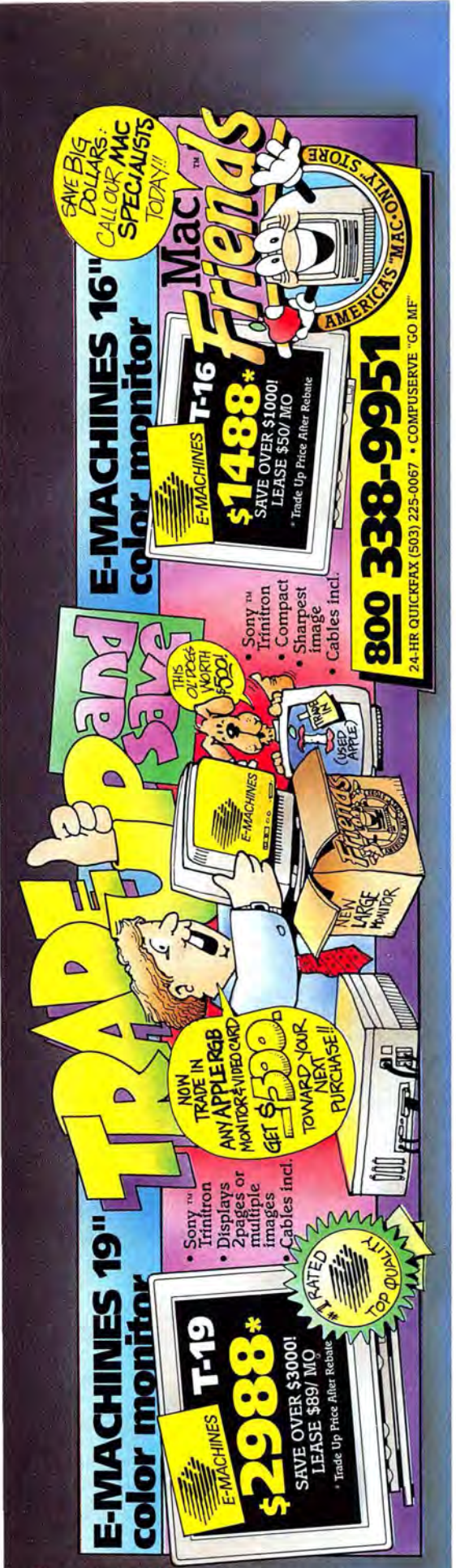
★★★½

If *USA Today* has succeeded in one thing, it's made charts a standard part of our collective consciousness. Cheshire is an INIT that makes creating simple charts easy.

To create a chart, select a set of tab-delimited data and launch Cheshire with an Option-Command-C (or other key combination you specify). Cheshire then opens a window with a list of 21 chart types, including various area, bar, column, and line versions; a scrolling, editable view of your data; and a reduced view of your chart. You can control the chart's appearance, font size and style, and decimal display in the Options dialog box. You can also transpose your data in the same dialog box. Once you're happy with the settings, press OK, and Cheshire pastes your chart into the document preceding your data. If you paste the chart into a drawing program such as MacDraw II or DeskDraw, every chart element becomes an independent object, so you can modify and embellish it to your heart's content.

Cheshire is fast and good at what it does, but it is limited. It extracts data from only four applications (MacWrite II, Word, MacDraw II, and PageMaker), charts are in black-and-white only, it can't plot discontiguous data, and most of the charts allow a maximum of only three data series. But because the program is modular, adding more capabilities and chart types (such as pies) is just a matter of dragging files into a special folder, so some of these constraints may be lifted soon. In fact, Abbott Systems is planning to sell packages of modules to supplement Cheshire's current arsenal.

Cheshire is a clever, well-implemented



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NEW ON THE MENU

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utility. Abbott Systems also deserves credit for a manual and help file that not only describe the chart types but also provide guidelines about which chart is most appropriate for your data. It also includes a developers' kit for the creation of new modules. Cheshire isn't an essential tool, but when you have to see a picture to get the picture, it's the cat's meow.

Abbott Systems, 62 Mountain Road, Pleasantville, NY 10570; (800) 552-9157 or (914) 747-4171. Version 1.0. $125.

— Russell Ito



Trax

★★★½



EZ Vision

★★★★½

EZ Vision and Trax are entry-level sequencers from, respectively, Opcode Systems and Passport Designs, two of the biggest names in music software. Both use the standard tape-recorder analogy, with stop, play, fast-forward, rewind, and record buttons. You enter notes either in real time as you play or through step entry, and you can invoke quantizing to tidy up any timing aberrations. EZ Vision and Trax work with Apple's MIDI Manager, and neither recognizes SMPTE (Society of Motion Picture and Television Engineers) Time Code.

EZ Vision. EZ Vision is more than a spin-off of Opcode's professional sequencer, Vision (see review, December '89, page 82). It includes most of Vision's basic components plus color, an Arrangements window, and the ability to view and edit different tracks at the same time.

EZ Vision's main Edit window contains the transport controls, step-editing functions, measure and tempo indicators, track and sequence selectors, zoom buttons, and quantizing options. Click the mouse, and the controller Strip Chart appears. The Strip Chart allows you to graphically edit controller information such as volume, velocity, program changes, and modulation. Although this may seem like a lot of stuff to jam into a single window, there's no sense of clutter. Other windows include Track Setup, where you assign instrument names, MIDI channel, octave transpositions, and serial ports; and the Program and Note Names window, where you name patches either through subscription to Galaxy (Opcode's universal patch librarian — see review, November '90, page 92) or by using the Mac keyboard. EZ Vision also includes a Mixer window, where you control and record the volume or velocity of each of the 16 tracks for automated mixdown.

With regard to track setup, EZ Vision takes a different approach from Trax. In EZ Vision, 16 MIDI tracks per sequence are available and you can have as many as 25 sequences per file. You can shuffle these sequences in an Arrangement window, where each sequence is viewed as a movable block. For example, sequence A is the verse, sequence B is the chorus, and sequence C the bridge. To create an ABACAB song, select each sequence from the pop-up submenu and click it into place.

EZ Vision's extras are what really make it special. For example, the program assigns 1 of 16 colors to the note and controller information and the mixer channel of each track, so you can distinguish multiple tracks in the same window. You can skip backward or forward in the track, with a feature called Scrubbing (similar to a tape recorder playing while rewinding or fast-forwarding). Playable Quantize quantizes your material in an impermanent way. If you don't like the quantizing results, just choose a different value from the pop-up window or skip quantizing altogether.

Trax. Trax uses the same graphic interface as Passport's professional sequencer, Master Tracks Pro (see "Multitracking MIDI Master," December '87, page 180). The program opens with the Track Sheet window, which contains the 64 available tracks, MIDI channel and instrument program-number assignments, and loops (play only). Below the Track Sheet are the Transport window, which contains the tape-recorder functions along with the measure and time indicators, and the Conductor window, in which you can change the time signatures and tempo.

Having selected a track and recorded some music, you can view that information as blocks of measures in the Song Editor window. To gain access to a specific note, you double-click on the correct measure in the Song Editor window. This brings up the Step Editor window, where you can edit the note's velocity, pitch, rhythmic location, and duration. The Step Editor window also contains all step-entry functions.

Trax includes some extra goodies to make recording a bit easier. To save valuable memory, you can choose to filter out incoming MIDI data, such as pitch bends, and controller information. To help you keep track of your verses, choruses, and

cadenzas, Trax provides markers that you can name.

Trax is a solid, general-use sequencer, but it could use some of the higher-end functions found in more-powerful sequencers — and in EZ Vision.

Trax and EZ Vision are surprisingly powerful programs for beginning electronic musicians. But in making the choice between the two, EZ Vision has the clear edge based on its wealth of features and ease of use.

EZ Vision, Opcode Systems, 3641 Haven Drive, Suite A, Menlo Park, CA 94025; (415) 369-8131. Version 1.0. $149.

Trax, Passport Designs, 625 Miramontes Street, Half Moon Bay, CA 94019; (415) 726-0280. Version 1.2. $99.95.

— Christopher Breen

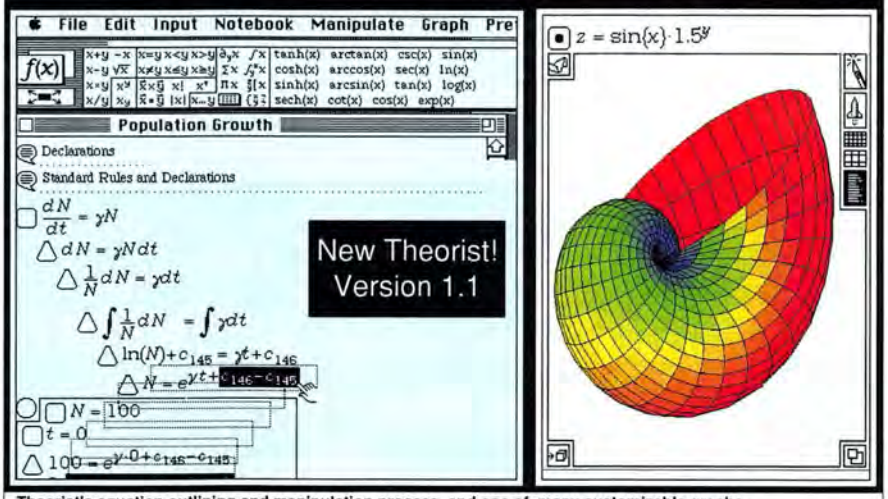


HandOff II supplements the transparent application-substitution capability of the original version (see review, February '90, page 53) with a launching menu. HandOff II's launching capability is a major improvement over OnCue. When you try opening a document whose application isn't available, HandOff II presents a dialog box in which you can choose an alternative application, and the program optionally remembers your selection. The next time you open a document created with the missing application, the same substitution is used automatically.

HandOff II also lets you substitute applications in two other ways. You can assign all documents of a given type (PICT, for example) to a particular application (such as Canvas). HandOff II also recognizes DOS-like filename extensions — a period followed by three letters — so specific extensions (.arc, for example) can be assigned to specific applications (such as StuffIt Deluxe).

As with OnCue, you can install applications and attach documents to them in HandOff II's Launch menu. You can also install two other kinds of menu items. A *category* groups related applications in a submenu. A *briefcase* is Software Innovations' term for a group of documents that are used together. You can group several documents into a named briefcase and launch all of them simply by selecting the briefcase name, or you can open an individual document by selecting it from the submenu attached to a briefcase. When

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– Five mice review,
MacUser *magazine*

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– MacUser *magazine, Editors' Choice Award, Best Math/Statistics Program of 1989*

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you're running under MultiFinder, briefcases can launch documents from multiple applications simultaneously.

Application substitutions and the Launch menu are configured through the Control Panel. HandOff II can remember separate pixel-depth (number of colors or grays) and volume settings for each application, and makes the appropriate changes to the settings each time a different application becomes active. This utility is definitely in a league with Suitcase II — and it's indispensable.

Software Innovations, P.O. Box 811, Allen, TX 75002; (214) 727-2329. Version 1.1. $79.95.

— Darryl Lewis



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VideoPaint

VP ★★★½

VideoPaint started out several years and many bugs ago as the French import GraphistPaint, an 8-bit graphics-and-retouching program. Although the name is new, not much else has changed. Speed is somewhat improved, but VideoPaint still isn't fast. The manual is better, but there are still some serious terminology problems. What makes VideoPaint worthwhile are its special effects, many of which are found nowhere else.

Basic operation is multilayer, with masks always available. The Stencil layer is essential, because many of the special effects are created in this layer and then blended or moved into the main layer. You're limited to only one open document at a time, however, so transferring work between documents can be cumbersome.

The Incrust special effect, for example, puts the contents of the Stencil layer into the selected graphics item or area in the main layer. A painting of a marble pattern, for example, can be placed inside the letters of the word *Marble*, producing a written-in-stone look. The Spherization special effect converts a rectangular selection into a circle, producing a "fish eye" effect. Although they're spectacular, you won't use these features every day.

VideoPaint includes tools for creating regular 3-D objects (rectangles, cubes, 3-D circles, spheres, cones, cylinders, and perspective planes) in both solid and wireframe modes, but this is not Swivel 3D or Super 3D by a long shot.

VideoPaint includes drivers for Microtek and Sharp scanners, and it can import MacPaint, PICT, PICT2, PixelPaint, Color TIFF, LZW, and Studio/8 files. The export list is even longer, including EPS, gray-scale PostScript, and PostScript CMYK formats. A developers' kit is available for users who want to create their own extensions.

VideoPaint can create visual effects that are difficult — or impossible — to achieve in other programs, and it does so fairly easily. The program is hard to learn, and the manual could be much better. Once mastered, VideoPaint's operation is slow but quite easy. If you're looking for

an everyday color painting program, you would be better off with DeskPaint or Studio/8. But if you're interested in something special, VideoPaint is certainly worth investigating.

Olduvai, 7520 Red Road, Suite A, South Miami, FL 33143; (305) 665-4665. Version 1.0. $495.

— Steven Bobker



Armor Alley

$$$$

Armor Alley is more than an exercise in blowing up tanks, helicopters, and personnel — although these pleasures are addressed in full. You command a single helicopter and are responsible for ordering convoys of tanks, missile launchers, personnel, and vans equipped with electronic gear. After deploying the convoy, you must transport infantry to the front lines and provide air cover against an enemy who, like you, is equipped with the engines of war. Because your helicopter needs refueling and you're supplied with a limited number of missiles, bombs, and machine-gun rounds, you need to develop strategies to keep the enemy at bay while you fly back to the base to refuel and pick up new weapons.

In individual play against the computer, you must complete ten levels of increasing difficulty in order to win. In two-player mode, you connect to the other player via modem (1,200 bps or faster). The second player can use either a Mac or an IBM PC. As many as four people, working in teams of two, can play the game over an AppleTalk network. In multiplayer setups, each player must own a copy of the game.

Armor Alley differs from typical military-hardware games in that strategy is more important than hand-eye coordination. You are rewarded for saving lives rather than for ending them needlessly. In the player-versus-computer mode, the enemy has unlimited helicopters, so you must escort one of your vans to the enemy base in order to win. But in the multiplayer mode, you have the additional option of winning by attrition: You can destroy all the enemy helicopters, either through judicious use of your weapons or by tricking the enemy into running out of fuel or funds. Either way you go about it, your brain is likely to get a better workout than your wrist, which in itself is a unique idea. In that respect, Amor Alley is a particularly contemporary game, as it places its

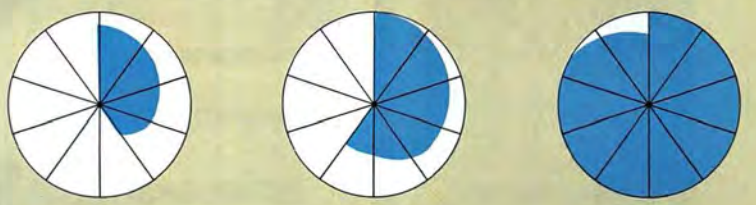


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emphasis less on sheer might and more on strategy and tactics.

Three-Sixty Pacific, 2105 S. Bascom Avenue, Suite 380, Campbell, CA 95008; (408) 776-2187. Version 1.0. $49.95.

— Christopher Breen



interFACE raises random access animation to a new level, by letting you match an animated face's lip positions with words. interFACE's agents, called Actors, are usually faces, but the package also includes dinosaurs and other creatures.

The interFACE interface consists of three separate partitions. The first partition is the Dressing Room, which holds all the tools used to create Actors. This 256-color painting environment is very HyperCard-like. The primary focus of the Dressing Room is the Easel, where the images of the actors are built. The first image is the rest, or base, image. A handy visual guide for each type of sound and expression sits on the desktop for easy reference. Drawing Actors takes patience, because you're not creating a piece of art just once, but repeatedly modifying a basic image.

A helpful set of facial clip art is on the Dressing Room menu, but it's difficult to get used to interFACE's approach. interFACE's art is pasted onto the desktop and must be cut from its own floating window before it becomes a real bitmapped image on the Easel.

From the Dressing Room, you move to the Stage, but about the only benefit you get is hearing your actor speak in MacinTalk. Bright Star should integrate the Stage into the Speech Sync Laboratory feature.

The Speech Sync Laboratory mates a digitized voice with an image. Farallon's code for recording sounds is included in the application, so you don't need to switch between MacRecorder and interFACE. Previously recorded sounds can be imported from stacks or MacRecorder files. Once a sound is recorded, you type what was said into the text window; convert it into a phonetic expression; and recite it back, using the RAVE driver commands.

The biggest functional problem with interFACE is synchronization. With MacinTalk, your sounds and images are in perfect harmony. With MacRecorder digitized sounds, the mouth rarely appears in sync. With time and effort, you can use the Speech Sync Laboratory to get the voice and face closer in sync.

An annoying problem with interFACE, however, is the time it takes to maneuver through the application. Switching into the Dressing Room from the Stage takes a long time, for instance.

Still, interFACE is a good tool for building interactive, educational software, no matter what level of education you target.

Bright Star Technologies, 1450 114th Street, Suite 200, Bellevue, WA 98004;



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(206) 451-3697. Version 1.0. $499.95.
— Daniel W. Rasmus



4½

VideoQuill's sole purpose is to produce high-quality type for video or multimedia presentations. But at $495, it's an expensive — and not wholly successful — one-trick pony.

VideoQuill requires a 32-bit-color system and at least 2 megabytes of hard disk storage. The program can use only its own outline fonts, and it can't convert Type 1 or Type 3 fonts into its special format. VideoQuill comes with Times, a pseudo-Helvetica, and a display face called FG Nuvo Roman. A supplementary font pack with 47 additional fonts costs $495, which doubles the purchase price.

The VideoQuill's Tool palette contains a text tool, a filled-rectangle tool for graphic objects (but no ovals, polygons, or lines), selection and rotation tools, and a tool that creates picture boxes for placing TIFF or PICT images into a layout or selected text block. Colors are assigned in the Color palette. You can create linear color blends between any two colors and assign varying levels of transparency. There are equivalent controls for creating backgrounds too.

You can assign anti-aliasing to text, and the result is far better than the screen images generated by ATM in other environments. Kerning is limited to vague values, and the intercharacter spacing is equally crude. There are also controls for leading and interword spacing.

VideoQuill exports PICT or TIFF files, and VideoQuill text can be overlaid on captured video images. A special menu accesses Data Translation's ColorCapture 2.0 board, letting you use video in VideoQuill layouts, including live video for filling text.

VideoQuill's omissions, however, overshadow its potential. The program lacks em and en dashes, but even worse is the omission of left-hand smart quotes. Data Translation's tech-support staff actually told me to rotate the right quotes to generate the left ones! There are no alignment features — you have to eyeball everything, and because you can't group objects or text blocks, or even select all, small adjustments are a big pain.

VideoQuill is also *slow*. You can speed things up by choosing the Fast Display command, but it's still lethargic.

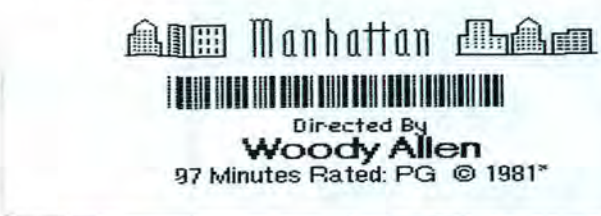
The anti-aliased text that VideoQuill generates is attractive, but the program's many flaws and low cost/features ratio make it difficult to recommend. VideoQuill is most definitely not the ideal environment for manipulating text in conjunction with other graphics and images.

Data Translation, 100 Locke Drive, Marlboro, MA 01752; (508) 481-3700. Version 1.0.1. $495; VideoQuill Font Pack, $495.
— Gregory Wasson

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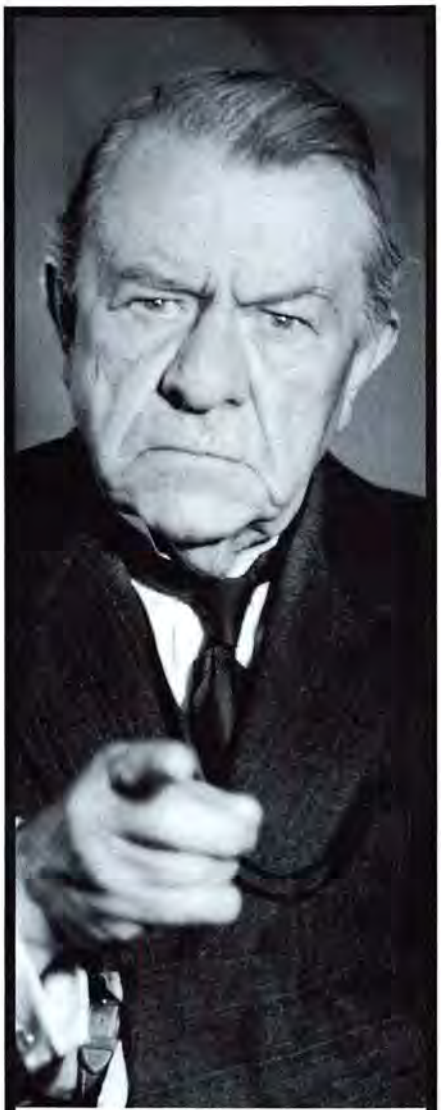
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QUICK CLICKS

LifeGuard

★★★½

Working continuously with your Mac can leave you crippled, but not because you've got a miniature Three Mile Island sitting on your desktop. RSI (repetitive-strain injury) is a clear and present danger that's left many computer users handicapped by injuries such as carpal-tunnel syndrome and tendinitis. But the answer to RSI is surprisingly simple — prevention, which means taking frequent breaks. LifeGuard is an INIT that monitors your activity and tells you when you should take a break.

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In addition to on-line help, the LifeGuard DA includes information on the ergonomics of computer workstations as well as some gentle exercises. The illustrations for both the ergonomics and exercises fall into the crude-but-effective category, with heavy emphasis on crude.

Lifeguard can't prevent RSI — after all this isn't fascistware. It doesn't lock your machine so you can't work, but it may help. If you need to be reminded to take frequent breaks, LifeGuard may be the anti-time clock you need.

Visionary Software, P.O. Box 69191, Portland, OR 97201; (800) 877-1832. Version 1.0. $79.95.

— Russell Ito

Beyond

★★★★

Beyond is Dr. T's Music Software's first Mac-specific product, and it's not a port. Like most first efforts, Beyond has its

flaws, but there's enough that's well done in this sequencer to make it worth considering. Dr. T's has done a good job of implementing the Mac interface, and the manual is excellent.

The well-designed tutorial lets you construct a song, and in so doing, it shows you the best parts of Beyond. You can "drop in" melody or rhythm patterns as subsets and place them, graphically, anywhere you want. To shorten or lengthen a pattern, you just click and drag.

The Clocks per Quarter Note feature is useful. As the number of ticks is reduced, the program moves more quickly, because it has less computing to do. On a 68000-based Mac, this acceleration alone could make Beyond worth the purchase price, and it's a feature I don't recall seeing on any other sequencer. There is also a Human Feel option that can randomize functions to more closely approximate human playing.

Beyond even offers compositional assistance. The Chromatic and Intelligent Harmonies function can add harmonies to your melodic line from six different modes. After trying several passes, I found some kinks, but this is a nice concept and shows real promise.

The next update will have to address several problems. The Display List info cannot be changed or edited—this should be corrected at once. The Set function still needs work, and the multitude of ultracutesy icons gets confusing quickly. The program lacks a graphic (or note) editing function, and the lines representing sequences can get abstract at times. You can select only individual tracks for copying and pasting. Beyond can open standard MIDI files, but I had a problem opening and playing a file of only 90 bars and 15 tracks. You can have up to 30 "ganged" instrument channels that can be mixed with on-screen faders, but Beyond includes only a basic form of automated mixdown.

If the programmers keep working on it, Beyond has the potential to be an excellent program. The current version is a competent sequencer for midlevel users, but it should be priced around $200. If you already own a sequencer that you're happy with, there's no need to switch to Beyond. On the other hand, with some diligence on the part of Dr. T's, Beyond could be a program to watch.

Dr. T's Music Software, 220 Boylston Street, Chestnut Hill, MA 02167; (617) 244-6954. Version 1.5. $319.

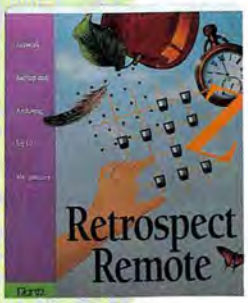
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The Best Macintosh Training Solution For SmallerTraining Budgets

60% of all new software purchased is abandoned within 3 weeks according to a recent survey in *PC Magazine*. Statistics show that hundreds of thousands of dollars are wasted by companies and by individuals who purchase software programs that are never used.

The survey only mentioned programs that have been put away on the shelf. It didn't add in the staggering number of computer users who use *only ten to fifteen percent of their program's capabilities.*

Think of the price of today's Macintosh software. It isn't cheap! Is this money wasted? Only if your Macintosh is half used, if your programs have been stuck on the shelf, or if your Macintosh users are not 100% trained on the computer and each business program.

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Quality.

There are other video training programs out there. Most of them are only 45 minutes to an hour in length. Nearly all MacAcademy training videos run a full two hours. Each trainer featured on MacAcademy videos is our highest rated instructor for that program from the two-day live MacAcademy workshops featured in over 100 cities throughout the U.S. Our instructors are not actors or software sales people. They are business executives who have been chosen from hundreds of applicants due to their excellent teaching skills, their thorough knowledge of the program, plus their hands-on business background using the featured program. MacAcademy instructors are unmatched in the industry.

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SuperPaint (Part 2) ____	PageMaker 4.0 (Part 3) ____	Works (Spreadsheet) ____	Utilities, CDEV, INIT ____
Excel 2.2 (Part 1) ____	HyperCard Basics ____	Word Perfect (Part 1) ____	MacWrite II (Part 1) ____
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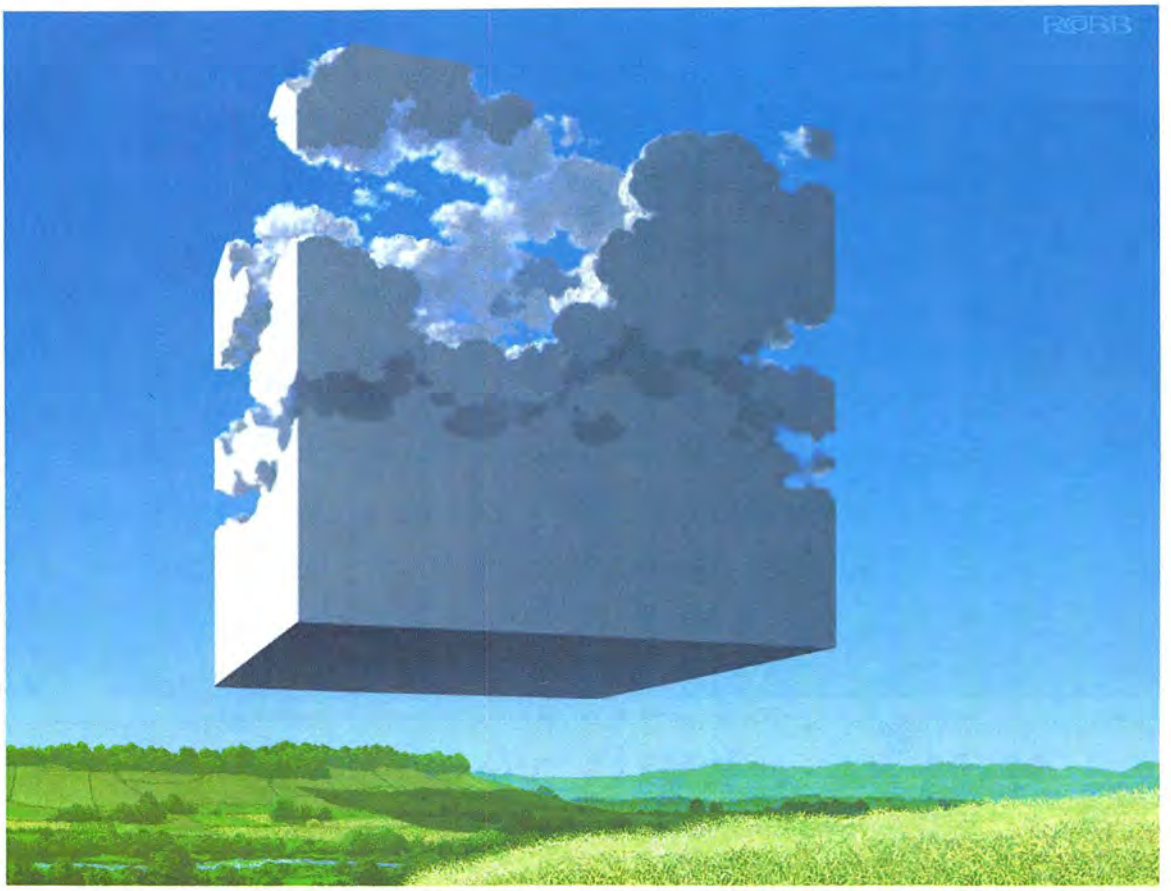
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MacUser

THE MACUSER MULTIMEDIA ENCYCLOPEDIA

Multimedia is *not* a revolution — it's an evolution. The multimedia evolution is bringing together a huge variety of hardware and software tools with a common goal: using the Macintosh in ways that involve the human senses — especially sight and hearing — and give users the sense of interactive control over the computer. *Multimedia* simply means using several communication sources simultaneously. Computer-based multimedia requires no more than a humble Mac Plus or Classic running HyperCard-based applications, with inexpensive add-ons providing sound and animation.

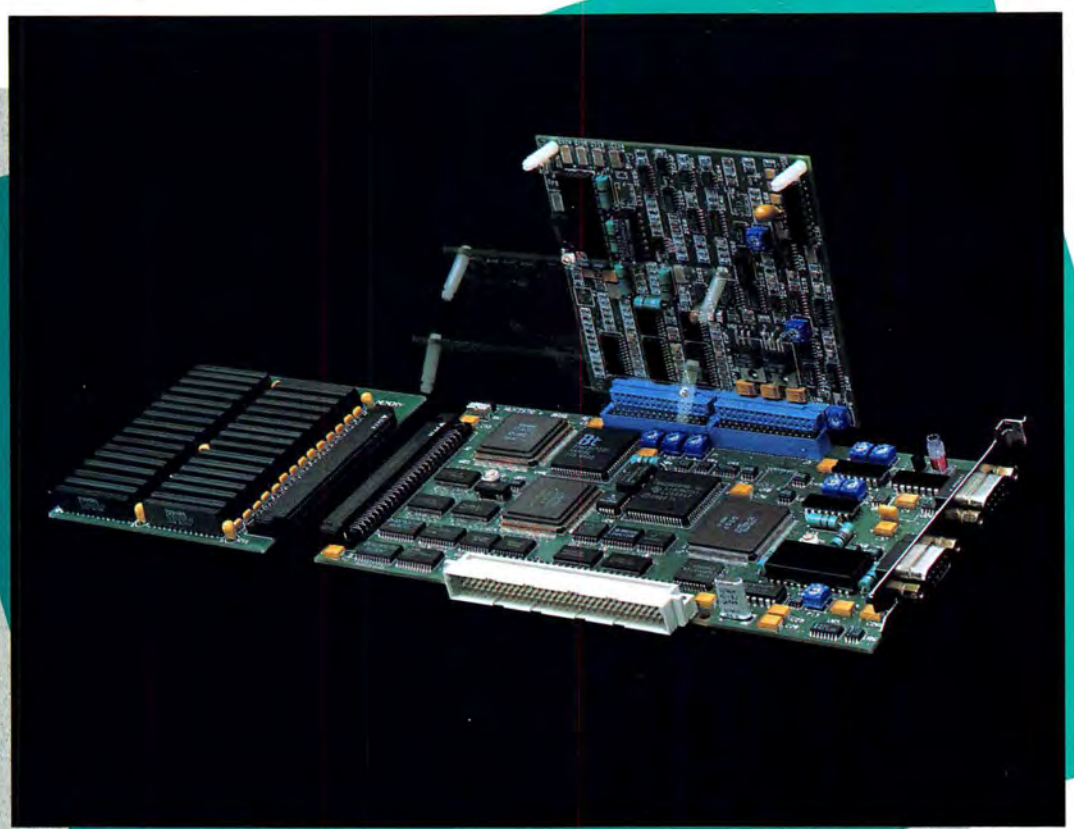
But the real challenge comes with full-blown multimedia setups, which can bloom into desktop multimedia studios costing tens of thousands of dollars.

Learning how to use all this gear to produce practical applications is a complex task, but you don't have to tackle everything at once. Professionals of every stripe — and every budget — can now add multimedia elements to their applications to give them tremendous punch.

In this trilogy of encyclopedic articles on video; sound; and the merging fields of animation, authoring, and modeling packages, we present you with everything you need to understand so you can start creating your own multimedia productions. Also, this issue's installment of our MiniFinders capsule reviews guides you to the best buys in graphic-arts and desktop-media products. And watch for future articles on how to integrate the diverse elements in your multimedia arsenal.



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Truevision provides the key to integrating video and the Macintosh®. Now it's easier than ever to videotape your presentations, training materials or animations, thanks to NuVista+. It provides a true broadcast-quality signal for video in and video out. Simply connect the NuVista+ to your VCR and record.

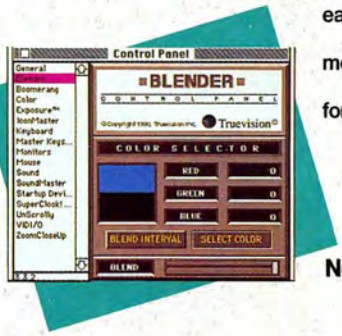
Plus, with new features like digital linear and chroma keying, it's simple to achieve professional results. Best of all, the NuVista+ has reduced the cost of professional quality video production while adding exciting new features.

NuVista+ Is Your Key To Video Production.



Your Key To Video Connections.

Making the right connections simplifies most projects. So the NuVista+ now offers composite and S-Video encoding and decoding on-board, making it easy for you to connect to any video source. The encoder and decoder adjustments are accessible from any application through the Control Panel. Controls for signal source selection, hue, saturation, and contrast are all easy to use.



New Keys For Creativity.

The new linear keying functions are accessible from the Control Panel and let you fade to any color or blend live video with computer generated text and images. And now you can choose any color, even in 32 bit/pixel mode, to overlay a computer-generated image or animation onto live video.

Savings and Flexibility Are Key, Too.

Just by integrating the video encoding and decoding onto the NuVista+, we saved you the cost of a VIDI/O™ Box. But we didn't stop there. We've incorporated the new keying features which previously required additional expensive peripherals. And we've added flexible memory upgrades.

The NuVista+ base model, packed with all these features, is priced at $2995. It contains 1MB of high-speed VRAM, making it ideal for 16 bit/pixel video. And you can upgrade to a 2MB or 4MB configuration for 32 bit/pixel NTSC or PAL production. See your local Truevision Reseller for more info, or call us at 800/858-TRUE.

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BY LON MCQUILLIN

MULTIMEDIA AND VIDEO

You now can blend TV-quality video into Mac-based applications with stunning effect — if you're willing to work for it.



Figure 1: Input devices include video cameras, scanners, laserdisc players, and video recorders. Video sources are first scanned by a digitizer or frame grabber, and the images and sound are then converted to Mac files. NTSC output and overlay boards create an NTSC signal that can be viewed on an NTSC monitor or recorded on tape. Control systems let the Mac control videodisc players and video recorders for multimedia presentations and/or video editing.

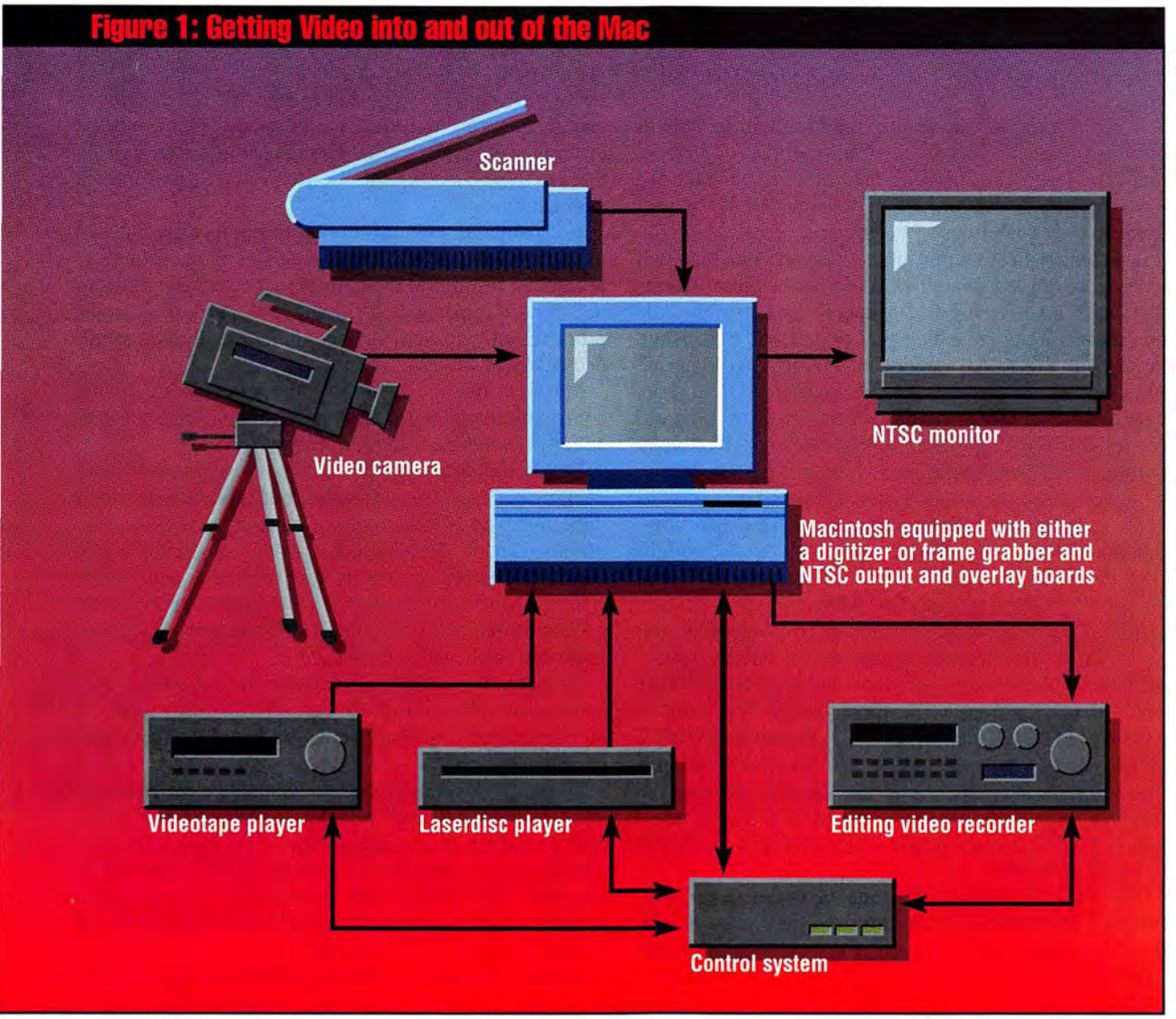
At a recent trade show, one booth consistently drew crowds. The draw? A Macintosh running a scene from *Star Wars* in a small window on its screen.

Such a display, and the crowds watching it, demonstrates how far we've come in bringing video to the Mac environment — and how even simple multimedia applications can mesmerize people. It's reminiscent of the dawn of motion pictures, when people flocked to theaters just to see a clip of a train pulling out of a station.

Adding video capability to your system can transform your presentations, simulations, training applications, and more. And the cost won't necessarily break your bankroll. A NuBus board that provides output to a VCR can cost as little as $600, although the investment path can easily climb above the $10,000 mark for high-end equipment.

Such gear won't replace what is found in video-production studios. Not yet. But Macs can process recordable video signals at a level of quality acceptable for many uses.

Figure 1: Getting Video into and out of the Mac



Pioneers are already integrating video into their applications, but mainstream users are waiting for turnkey systems. If you want to stay ahead of the pack and don't mind doing some tinkering, the time to bring video into your multimedia plans has arrived.

Given a sufficiently powerful Mac system, you can do a lot with video (see Figure 1). You can capture still-video frames in standard file formats — handy for adding digitized mug shots to your personnel files, for example. You can display live video from an external source, either as stand-alone images or with Macintosh-generated graphics.

You can record Mac-created graphics on the cheapest presentation medium around: videotape. Or you can have 3M or Pioneer transfer your output to a laserdisc for interactive applications. The first disc costs about $2,000, but additional copies cost only about $10 each.

You can also overlay graphic elements onto a real-time video signal, and you can control peripheral video devices such as VCRs and laserdisc players.

Best of all, you can combine many of these functions. For instance, the Macintosh can be used to control playback from a video source while displaying the video image.

In the not-too-distant future, the Mac will be able to provide storage and playback of full-motion, full-screen, real-time video, thus offering the best of two media: the record/playback capabilities of videotape and the random-access capabilities of videodiscs.

This ability to store real-time video on your Mac will let you build self-contained multimedia presentations that need no external video source and that provide nonlinear editing — which means you will get instant random access to any section of the original material. This will let you preview edited programs in real time; with traditional videotape-based editing you must record scenes onto the master tape before viewing. Nonlinear editing will let you make and view changes on the fly. You won't have to rerecord edited master tapes.

Don't hold your breath waiting for these capabilities, though. We're going to need some basic breakthroughs first in the challenging process of integrating digital computers with analog media such as video.

Video — especially full-motion video — demands a lot from a Mac, both in processing speed and storage capacity. All but one of the video-hardware products extant require a Mac II, and for many applications a IIci or IIfx won't be a luxury. At least 2 megabytes of RAM, and preferably 8 megabytes or more, is necessary. An 80-megabyte hard-disk drive initially might provide adequate storage, but don't be surprised, especially if you're using digitized video, if a 300-megabyte unit or even an optical drive or two are necessary.

The following listings describe the major video components of a multimedia setup and how they integrate. For definitions of some of the more arcane video-industry terminology, see the "Basic Video Glossary" sidebar.

Video Quality

The video industry divides video-image quality into three levels: broadcast quality, industrial quality, and home-video quality. You can't really tell the difference among them on high-quality home equipment, but the difference is clear after that footage has gone through the three to five generations needed to produce a multimedia application.

Video-image quality involves many factors, but two measures suffice to differentiate classes of image quality: horizontal resolution in lines per inch and S:N (signal to noise) ratio in decibels. With the latter, electronic noise produces obvious video degradation at about the 40-decibel level.

Macs are being used at all three levels to create and control multimedia productions, although few are found so far in broadcast-quality operations.

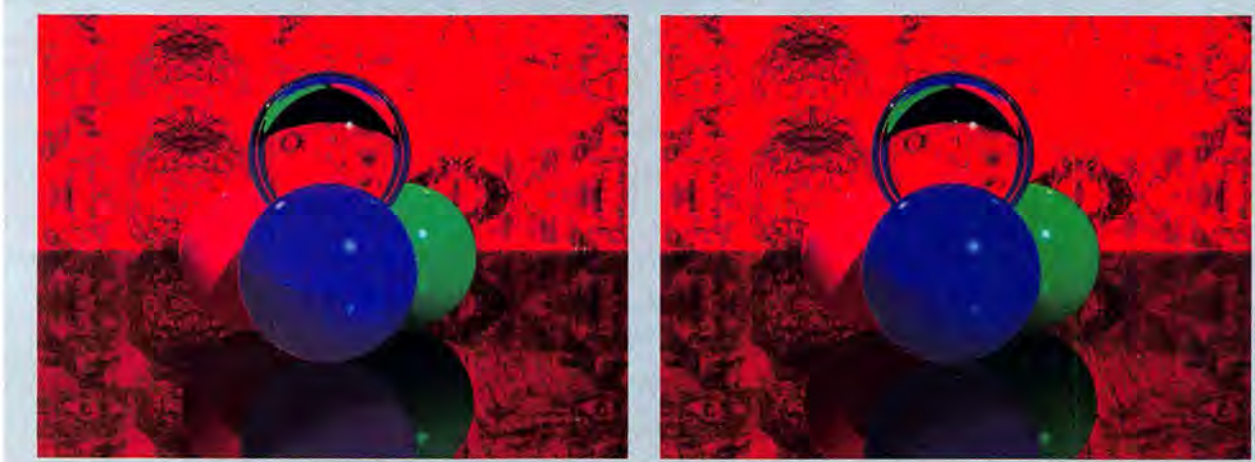
Broadcast Quality. This is what you associate with network TV and high-end production houses. It is achieved with professional three-chip or tube cameras; recording on Betacam or MII ½-inch, 1-inch, or digital VTRs (videotape recorders); and editing on similar equipment. It provides a resolution of 400 to 600 lines and S:N ratios of 50 to 55 decibels. In comparison, 35mm movie film has thousands of lines of resolution.

With digital equipment, there is no loss of quality with subsequent generations of tape. With other types of equipment, quality degenerates by 1 to 2 decibels with each generation.

Digital VTRs cost $40,000 to $100,000 each. For basic editing, you need two VTRS, but to add dissolves, wipes and special effects, you need three VTRs (two source and one record), a controller ($5,000 to $30,000), a monitor, and two TBCs (time-base correctors, to synchronize signals, at $1,500 to $10,000 each). Such a setup lets you do what's called A-B roll editing.

Industrial Quality. You can get industrial quality with

Figure 2: Image Compression



low-cost three-chip or the best one-chip cameras, recording on 3/4-inch VTRs. Such equipment provides 300-to-400-line resolution and 50-to-55-decibel S:N ratios.

With every generation, you lose 1 to 3 decibels. The smaller tape size can't read the NTSC color signal directly, because of a lack of bandwidth, so it's translated to a lower frequency, with additional loss of color quality. VTRs cost $7,500 to $20,000. Some TBCs may cost half as much as those required for broadcast quality, and overall the equipment cost is far less than that of broadcast-quality gear.

Home-Video Quality. There are two levels of quality, each in two formats: VHS and 8mm, and S-VHS and Hi-8mm. You may get slightly higher color quality from 8mm than you can get from VHS. At the higher-quality level, you get approximately 400-line resolution and a 45-decibel S:N ratio. At the lower level, you get 240-line resolution and an S:N ratio of around 40 decibels.

With each generation, you lose 3 to 5 decibels. After three generations, colors no longer register properly, with red becoming particularly streaky. You also get blurring, smearing, and haloing of the images.

Lower-quality VTRs cost from $250 to $1,000, higher-quality models from $1,000 to $4,000.

The best consumer machines verge on industrial quality, and even standard consumer equipment is now being used in situations that don't require top-level quality.

Analog Versus Digital

There are two conversion problems when you use a Mac with standard video equipment. First, you must convert analog images into digital ones, and digital ones to analog, to move images between the Mac and the video equipment. You'll go from analog to digital (called A-to-D or A/D converting) when importing video into the Mac environment, and from digital to analog (D-to-A or D/A converting) when recording or displaying Mac images on standard video equipment.

Second, the scanning system used to create the Mac's display differs from that used for NTSC video (the kind of video American TV uses). Standard Mac color displays scan sequentially, in noninterlaced mode, one line at a time, from the top to the bottom of the screen. The complete display scans 66 times per second.

NTSC video, on the other hand, uses interlacing, as do many DOS systems. It scans each consecutive image in two passes. Of the 525 lines that comprise one full NTSC frame, first the odd-numbered lines 1, 3, 5, 7, . . . , 523, 525 are scanned. This creates the first "field." Then the even-numbered lines are scanned, creating the second field. The second set of lines is supposed to fall directly between the numbers of the first set, producing a frame of video. The field-scan rate of approximately 60 times a second yields a frame (both fields) -scan rate of about 30 frames per second.

Composite, S-Video, and Macs

In the world of consumer and semiprofessional video, video signals come mainly in two forms: composite video, which combines brightness and color information in one signal, and S-video (also called Y/C video), which sends brightness and color information in two separate signals. High-end consumer and industrial equipment requires a special connector for S-video.

A third type of video, called component video, uses three channels, one for brightness and two for color. Commercial broadcast equipment often uses component video.

Computer color displays, including the Mac's, generally use the RGB format, which transmits signals in red, green, and blue channels. Converting a composite or S-video signal to RGB is known as decoding; the reverse is called encoding.

To receive a video signal, do something with it, and



Figure 2: The original 24-bit image at left is shown after compression to 165 bytes (center) and 51K (right) using Kodak's Colorsqueeze software. The center and right images are how each appears after decompression. The center image shows little degradation, whereas the highly compressed image at right shows a considerable reduction in quality.

Figure 3: Capturing Video



then convert it back into video, you decode, do an A/D conversion, do stuff, do a D/A conversion, and encode. To do all these steps, you either need to wire together many different hardware items or buy a costly multifunction device.

The actual conversion processes are technically straightforward and can be accomplished with hardware from many vendors, at a wide range of capabilities and prices. However, two main factors — data density and conversion speed — constrain what the Mac can do with video.

Data Density

Broadcast video takes gobs of computer resources to digitize. A standard NTSC broadcast-video frame has 483.5 active scan lines and a 4:3 aspect ratio (width to height). Thus, to see a Sony Trinitron-quality, square-pixel image on a computer screen, you need 24-bit color and resolution of 640 x 480 pixels. That adds up to 921,600 bytes per frame. Thus, 60 megabytes of hard-disk space can store 65 frames. At the roughly 30-frame-per-second rate of NTSC video, this would deliver slightly more than two seconds of video. Even a 600-megabyte hard-disk drive would store only 21 seconds worth of full-motion, broadcast-quality video. You can see why multimedia mavens are following all the advances in data-compression technology so avidly.

Current digitizing hardware offers resolution ranging from 640 x 480 pixels to 1,024 x 512 pixels or even more. The 640-x-480-pixel figure, which is the resolution of the AppleColor High-Resolution RGB 13-inch monitor, is the most common, and because it is close to broadcast standards, it's generally considered acceptable. Higher horizontal numbers can translate to increased resolution, but anything beyond 483 vertical lines gets wasted, because of the fixed number of lines in the NTSC system. A horizontal resolution of 640 pixels translates to a theoretical 640 TV lines, which exceeds what any current system — broadcast, composite video, or even S-video playback — can deliver to the screen.

Many other countries use the PAL or SECAM systems and employ somewhat higher data densities than NTSC requires.

Digitizing Speed

With up to 30 megabytes per second of visual data charging through your Mac, digitizing speed can become as important as storage capacity. Digitizing hardware doesn't come cheap, although costs have been plummeting over the past few years.

For $1,000 to $6,000, you can get hardware capable of real-time digitizing. The cheaper boards may take 20 or 30 seconds, or even longer, to digitize a video image.

However, no current off-the-shelf system can save 30 megabytes per second to a hard-disk drive, nor can any display board retrieve and display full-screen 24-bit video in real time. The heart of the problem is the Mac's NuBus-slot architecture, which can't transfer data faster than about 13 megabytes per second.

In some applications, such as those that use the Mac to overlay text and graphics on a video signal, you don't have to digitize the incoming video signal, so the overlay board converts the Mac graphics to analog form, overlays them, and sends the video signal back to a recorder.

Even in applications that require digitizing or conversion of full-frame Mac images to analog video, you can overcome the speed problem by working one frame at a time, as you would with traditional animation. This will hamper your efforts to make applications interactive, though.





Figure 3: The original photo at far left was digitized as a 24-bit image from live video (left), as an 8-bit image from live video (above), and as an 8-bit image from a videotape still frame. Notice that the still-frame image (right) suffers from jaggies and low vertical resolution. This occurs because a still frame is actually only one field (half a frame) of video.

Image Compression

The mountain of data represented by a real-time full-color video signal has so far prevented the Mac (or any other personal computer) from letting you digitally record and play back video. At roughly 30 megabytes of data per second, a full hour of video needs about 108 gigabytes of information. You'd need one hundred eighty 600-megabyte hard-disk drives without even including sound.

Until major advances in mass-storage technology are made, efficient video-signal compression is necessary.

Never fear. Everybody's working on the problem, led by JPEG (Joint Photographic Expert Group) and MPEG (Moving Picture Expert Group). Both are defining methods of image compression and decompression to make real-time video recording and playback practical.

A major advantage of the method — called discrete cosine transform (DCT) and Huffman coding — being explored by the two groups is that it works symmetrically. Images compress and decompress at the same speed. Previous systems, such as Intel's initial DVI system, were asymmetrical, requiring more processing power for compression than for decompression. The JPEG standard has been endorsed by most vendors.

Nearly all the major hardware players are furiously working on developing compression technology. It is not unlikely that effective compression of 100:1 or more will be possible within the next year or two.

At that time, one hour of video could be mashed into a gigabyte or so of data, and a 600-megabyte hard-disk drive could record and play back 35 to 40 minutes of quality video in real time. Stranger things have happened.

Colorsqueeze. Eastman Kodak currently offers compression/decompression software for the Macintosh that can reduce 24-bit PICT and TIFF files by up to 14:1. According to Kodak, the $179 Colorsqueeze program can compress a 768K, 24-bit, 512-x-512-pixel file in less than 40 seconds on a Mac IIcx (see Figure 2).

PicturePress. PicturePress is Storm Technology's JPEG-compliant compression program. It comes with four default quality levels to choose from, plus a special 2:1 protocol that Storm says provides nondestructive compression of 24-bit-image files.

PicturePress Accelerator. PicturePress Accelerator is a combination of Storm Technology's PicturePress software and a NuBus card that uses two DSP (digital signal processing) chips to offer up to 100:1 compression for 24-bit-image files. Part of the compression software loads directly onto the card and then runs at 60 megahertz, independent of CPU clock speed. Storm Technology claims that this speeds compression so much that users can open and save compressed files as quickly as they can uncompressed files.

EFI. Another company developing compression systems is Electronics for Imaging. Starting with a software package, EFI plans to follow with a chip that provides the same compression/decompression capabilities as the software and then a board with associated firmware. EFI products will reach users under other vendors' labels.

CL-550 Processor. Hardware compression systems offer greatly increased signal throughput. The first company with a hardware compression system for the Mac is C-Cube Microsystems, with the CL-550 processor. This chip appears in various board products from different vendors. It provides compression ratios of 8:1 to as high as 200:1 and can work with video in real time.

Judging from compression/decompression examples provided, and depending on the nature of the image being compressed, ratios of 20:1 to 35:1 appear to provide images that look as good as the originals after the compressed files have been decompressed.

Digitizers and Frame Grabbers

A wide range of devices can digitize a video signal and convert it into a Mac graphic (see Figure 3). The PICT2 format is the most popular, followed by TIFF, and then by proprietary formats. The software that accompanies most boards generally supports several graphics formats.

When planning to use a videotape still frame, watch out for two potential problems. First, some VCRs exhibit a "noise bar" at the top or bottom of the frame that may pollute the image and cause problems for digitizers.

Second, unless you're using a VCR with a full-frame-buffer feature for digital effects, a tape still frame holds only one of the two fields of video needed to form an interlaced image. This cuts the vertical resolution in half, since only 262.5 lines of information, rather than the 525 lines that comprise a full frame, are being used to create a frame of video.

MacVision and Computer Eyes/Pro. You can buy a low-speed digitizer for less than $500. Two examples are MacVision from Koala Technologies and Computer Eyes/Pro from Digital Vision.

MacVision is an 8-bit gray-scale-only digitizer, and the Computer Eyes/Pro captures full 24-bit-color images. It requires a Mac II-series computer.

Both these units take more than 20 seconds to digitize a 640-x-480-pixel image, so they require either a videotape or videodisc still frame or a feed from a video camera shooting a still-life scene, or you can use a still-video camera such as the Sony Mavica or Canon XapShot system. These are similar to conventional consumer cameras but record onto a 2-inch floppy instead of onto 35mm film. (See "The Picture-Perfect Mac," January '91, page 245, for a discussion of still video.)

ComputerEyes/Pro has a special mode designed for capturing images from still-frame videotape. This mode crops the bottom of the frame to eliminate the effects of noise bars.

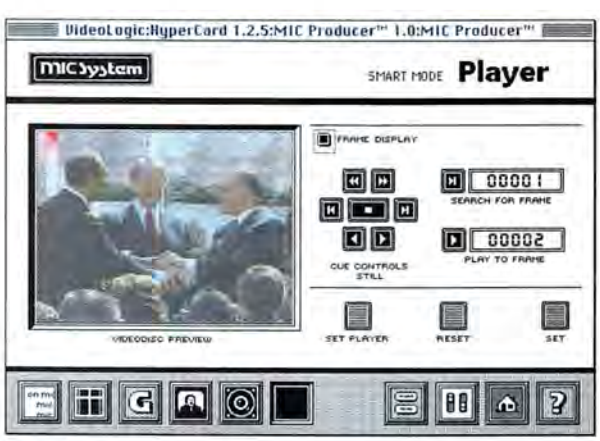


Figure 4: Easy-to-use buttons in VideoLogic's DVA-4000/Macintosh full-motion digital video adapter control live-motion video from any analog source on Mac II systems. Video sequences are defined frame by frame and saved to a button for playback from within a HyperCard stack.

ColorSnap-32. If you need to grab full 640-x-480-pixel video frames, you can try Computer Friends' ColorSnap-32, a NuBus card that displays a small preview window and digitizes full frames in a fifth of a second. It can save 24-bit PICT images or 8-bit PICT files that have been dithered with the Apple palette. It comes with modules that can be called from Photoshop and ColorStudio, so you can grab frames from within those applications. ColorSnap-32 is not compatible with the built-in video of the IIci or IIsi, but it will work on the IIci if a video card is installed. (The IIsi has only one NuBus slot.)

ColorSnap-32 provides excellent image quality when fed a still-video image such as that provided by a video camera on a copy stand. It doesn't handle videotape still frames very well, however. The board was intended primarily for use with images from still-video cameras such as the XapShot. Also, it has no controls for adjusting video or color levels before capture.

A new version, the ColorSnap-32+, which was not shipping at time of this writing, promises to grab frames from live video signals. It should also solve the IIci/IIsi-compatibility problem. Options will include 8-bit stereo audio digitizing at a variety of sampling rates, and image compression compatible with the JPEG standard (see the "Image Compression" section earlier in this article).

Working with Moving Images

Quite a few devices — at a wide range of capabilities and prices — are capable of displaying moving video images on the Mac's monitor. Most of these can also grab frames at varying sizes and resolutions.

Micro TV, DigiVideo, and DigiVideo Color. In the less-than-$1,000 range, three Aapps NuBus boards let you display a small video image on a Mac screen, either from a composite-video source or via a built-in tuner.

MicroTV displays a 1.5-x-1.8-inch monochrome image in a movable window on a Mac screen. The DigiVideo board increases the image size to 3 x 3.6 inches. The DigiVideo Color board displays a color image at either the 1.5-by-1.8-inch or the 3-by-3.6-inch size and offers a cable-ready tuner. The image is rather grainy, although some tweaking gets you fairly good color fidelity. All three boards feature built-in speakers and can also drive an external speaker.

Aapps boards "see" every frame of video, although the DigiVideo Color, with its larger image size, doesn't display every frame. Instead it runs at around 22 to 25 frames per second, depending on what other applications, INITs, and cdevs are also running. Aapps plans to increase the speed to 30 frames per second. The boards can grab a frame from a moving image, with a maximum image size of 256 x 216 pixels on the DigiVideo boards.

The Aapps boards let you watch TV on your Mac

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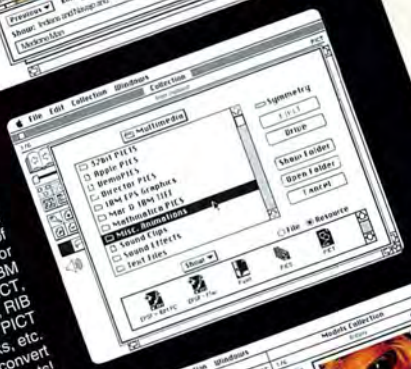
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Future Video: HDTV

Even as the Mac community comes to grips with NTSC video, the target is moving. High-definition TV (HDTV) will almost certainly supersede NTSC TV at some point. HDTV will bring us a better, clearer, and wider-screen video standard. It will double current NTSC resolution and increase the aspect ratio from 4:3 to 16:9.

Some movies and commercials are already being made with HDTV equipment from Sony, Hitachi, Ikegami, and other Japanese manufacturers. They record and display a beautiful 1,125-line, 60-field wide-screen picture.

Still, it's not 35mm film. Scrutinize an HDTV image, and you'll see thin scan lines, and the contrast ratio — HDTV or not — doesn't begin to match that of film.

And, as with TV today, we probably won't get a single worldwide standard. The U.S., Japan, and Europe insist that their own proposed standard must be adopted by the rest. Even within the U.S., more than 20 systems have been proposed.

The biggest challenge of using HDTV's Mac-based multimedia applications is that each image will contain a significant amount of data. For example, a full HDTV signal hogs two to six times the spectrum space allotted to today's television stations. So HDTV may require advanced image-compression techniques similar to those being developed for video on the Macintosh. And it makes the dream of full-motion, real-time video on the Mac at least twice as hard to obtain.

screen while doing other work. More usefully, they can serve such diverse functions as displaying an industrial process or security surveillance on a Mac screen while the user continues with other work and providing displays for teleconferencing. For example, NASA recently used two distant Macs with video cameras on top of them for two-way video teleconferencing. These boards can also aid desktop-publishing applications and find such uses as creating digitized images for employee IDs.

The DigiVideo boards also work in the background under MultiFinder, so you can watch a videotaped lesson on how to use PageMaker while running PageMaker in the foreground, for example.

Interesting applications might include creating a visual logging system for videotape production: A small digitized image could be captured at the touch of a key, along with text entry of notes referring to the frame. Furthermore, since the Aapps boards can dump real-time frames to disk, they can provide the basis for an inexpensive small-image, low-resolution, random-access video-editing system.

In pursuit of such applications, Aapps recently introduced Digital VCR, a software product that records video directly to a hard disk, and an expansion daughterboard, which digitizes sound and saves it to disk.

Aapps offers a developers' tool kit for $15 that can be obtained directly from the company or downloaded from CompuServe (GO APVENA).

QuickImage 24. Among the lower-priced frame grabbers is the QuickImage 24 from Mass Microsystems. It can grab a frame in 1/30 second from NTSC or S-video input. It also offers a preview window that can display 5 to 30 frames per second on a Mac monitor, depending on the size and color mode for which the preview window is set.

Personal Vision. Orange Micro's Personal Vision can display video at 15 frames per second and grab frames in 1/30 second. It allows RGB input only, but the company offers an NTSC decoder called the OMI Converter. Lacking the converter, the Personal Vision card displays a monochrome image.

Real-Time-Video Displays

For around $2,000, you can buy boards capable of displaying 30-frame-per-second video on Mac screens at larger image sizes. Such boards are useful in two ways. As display devices, they can be used in multimedia applications to import and display video signals. As frame grabbers, they can capture video images for off-line manipulation and later use as still frames. If this requires sending the images back out in video form, additional hardware may be needed.

Video Image 2000 Media Master. Scion Image Systems' Video Image 2000 Media Master can display a real-time 600-x-460-pixel 8-bit image and capture 24-bit NTSC or S-video images. When used with an optional National Semiconductor memory card that holds up to 16 megabytes of RAM, the Media Master can capture and play back short sequences of real-time video in small windows.

The Media Master also provides control of video sources through an infrared transmitter that can be "taught" in the same manner as the universal remote controls available for controlling TVs, VCRs, and laserdisc players can. It also captures 8-bit sound at selectable sampling rates of up to 44 kilohertz.

Every digitizer I've discussed so far is an input-only device that depends on a separate display card to create an image on the Mac screen and that cannot produce a recordable video signal.

Video ColorBoard 364. RasterOps offers video boards with a variety of prices and features. The Video ColorBoard 364, for instance, can display live video from NTSC or S-video sources and can grab frames. A companion unit called the RasterOps Video Expander allows Mac graphics to be output to videotape as well.

Although the Video ColorBoard 364/Video Expander combination does not let you manipulate a video signal in real time, you can use it as a video "still store" device. Thus, the graphics shown in a window next to an anchorperson in a newscast can be generated by a Mac.

WTI-Moonraker. Moving up a notch in price and performance, Workstation Technologies, Inc.'s WTI-

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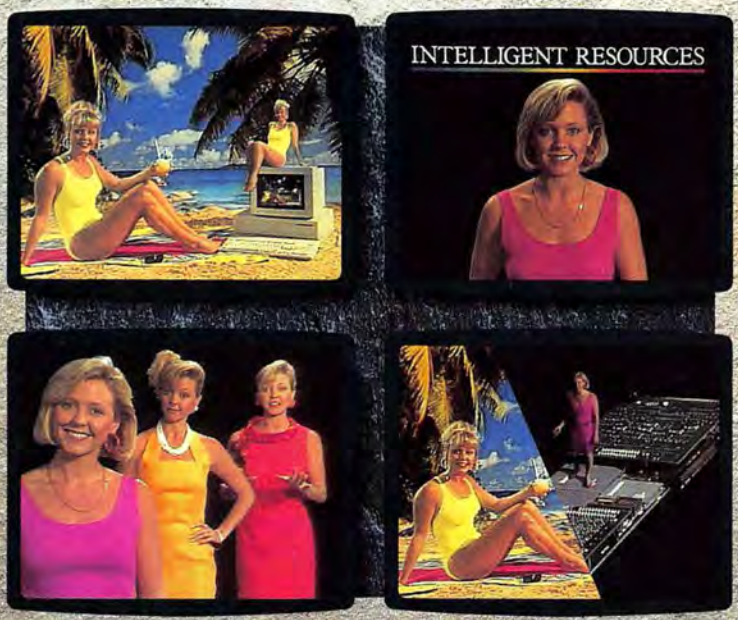
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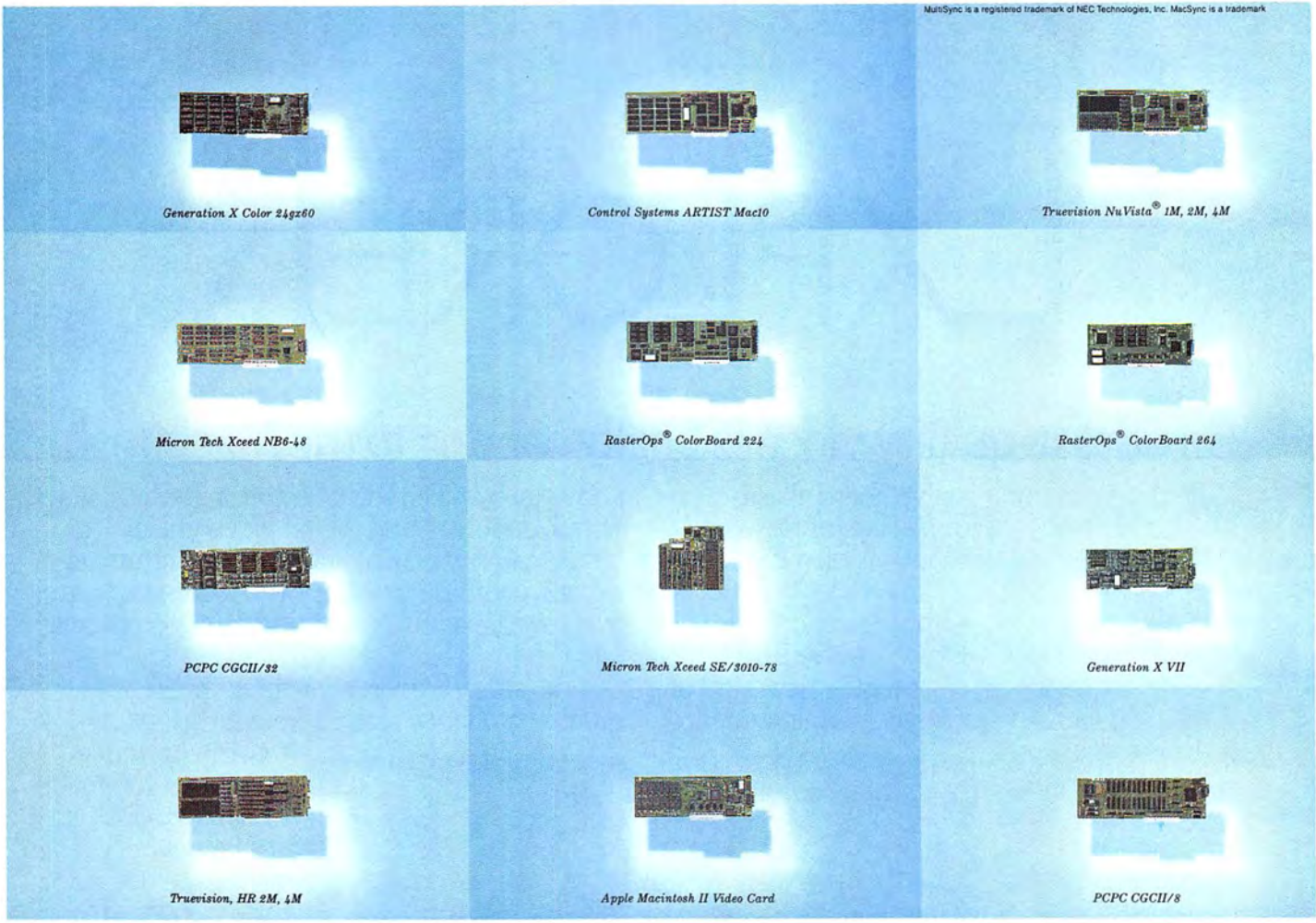
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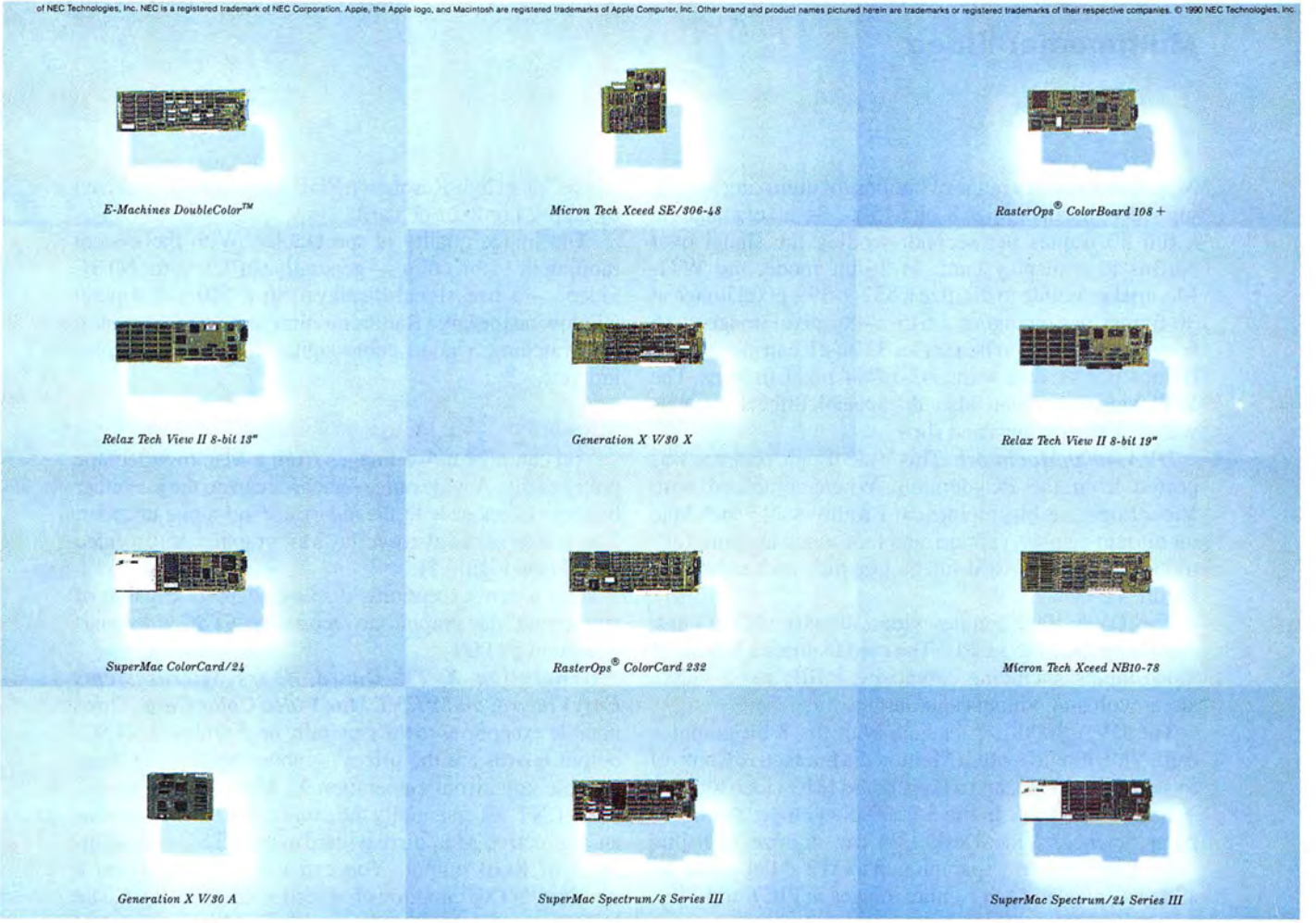


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Moonraker offers a range of options for digitizing incoming video. It can digitize 8-bit 645-x-484-pixel images at a full 30 frames per second, sending the signal over NuBus to a display card. In 16-bit mode, the WTI-Moonraker is able to digitize a 532-x-399-pixel image at 30 frames per second or a 645-x-484-pixel image at 15 frames per second. When set for 32 bits, it can move at 2.5 frames per second with 645-x-484-pixel images. The WTI-Moonraker can also do special effects such as warps, 3-D rotations, and flips.

DVA-4000/Macintosh. This VideoLogic package was ported from the PC domain. When combined with VideoLogic's 8-bit graphics card, it allows a 13-inch Mac monitor to display, capture, and fade video and mix full-motion video with still-image graphics and audio (see Figure 4).

The DVA-4000 handles video directly on the card, bypassing the Mac's CPU. The card features a full set of video inputs, including composite, RGB, and S-video, along with audio inputs and outputs.

The DVA-4000 is packaged with the 8-bit graphics card, VideoLogic's MIC (Multimedia Interactive Control) System II software, and a HyperCard MIC video tool kit.

VideoDesk 1/24. In the $5,000-plus range, the Computer Sciences VideoDesk 1/24 can digitize real-time video into a window spanning up to 512 x 484 pixels on a Mac display and can capture images in PICT and TIFF formats.

Radius TV. Radius offers a system that uses the Radius AV Input Processor, which combines a NuBus board and an external box. It offers five video inputs, two of which are RF inputs to a built-in tuner. Radius TV works with the Radius Color Display and graphics boards or with the AppleColor High-Resolution RGB 13-inch monitor driven by an 8•24 or 8•24 GC card.

The image quality is spectacular. With the system running in 16-bit color — generally sufficient for NTSC video — a live signal displayed in a 640-x-480-pixel window on the large Radius monitor matches what you'd see watching a good cable signal on a 10-inch color monitor.

Recording Mac Images on Video

You can now move images from a Mac to videotape pretty easily. A wide range of boards can do the job either by themselves or with the aid of a stand-alone encoder. Many of these can also overlay Mac graphics onto a video signal (see Figure 5).

With a few exceptions, display adapters capable of converting Mac graphics to recordable NTSC video start at around $2,000.

Generation X TV Board, Mass Microsystems EasyVideo 8, and VENT Mac Video Color Card. Three notable exceptions to the generally high prices of NTSC-output boards are the prices — about $600 — of these capable units from Generation X, Mass Microsystems, and VENT, all essentially the same card. They operate as an alternative Mac display card with NTSC output instead of RGB output. You can view the signal on a standard NTSC monitor or record it on videotape. The NTSC monitor shows up on the Mac's Monitors Control Panel and may be configured as the first, second, or other monitor.

These cards produce NTSC video whose quality is 95 percent of that of broadcast-quality video. You need to take some limitations into account, however, when you

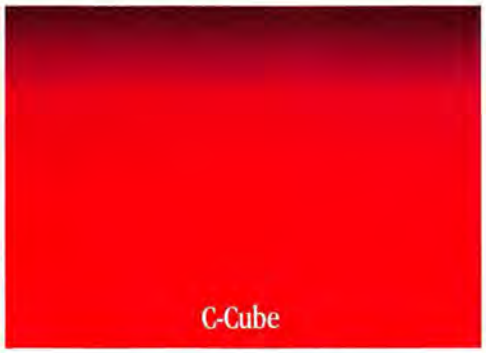
Figure 5: Video Overlay



Figure 5: Overlay boards enable the Mac to combine graphics with live video images. On 8-bit systems, a specific color is designated as the "key" color, which will be replaced by the video. Any graphic elements that are not the key color will be overlaid on the background video signal. On 32-bit systems, the alpha channel defines the areas to be replaced by live video. Mass Microsystems' ColorSpace III, working with MacroMind Director software, was used to provide the overlay shown here.

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design graphics to be recorded on tape or viewed on an NTSC monitor. The image size is 576 x 430 pixels, so if you place a full 640-x-480-pixel image on the NTSC monitor, the right 64 and bottom 50 pixels will fall off the edges of the screen. Keep the screen size in mind when creating graphics. Also, although these cards come close to filling the screen horizontally, you're likely to get a narrow black band at the top and/or bottom of the screen. This can be cleaned up with a professional-quality video switcher. The effect isn't obvious when you place graphic elements against a black background, but it is with a bright background.

TV ProducerPRO. This Computer Friends board attaches to the Apple Video Card and produces 8-bit-color video in NTSC form. It can perform video overlays. An RGB version is available.

ColorSpace Boards. Mass Microsystems' ColorSpace IIi features RGB and NTSC inputs and outputs at a relatively low price. It can overlay graphics and also provides slow-scan digitizing. When combined with the ColorSpace FX board, it can display real-time video and perform special effects in a resizable window on the Mac monitor, using special processing to reduce flicker.

Mass Microsystems also produces the ColorSpace Plus/SE, an external SCSI device that can overlay Mac graphics on live color video, using a Mac Plus, SE, Classic, or SE/30. This ColorSpace board includes circuitry that virtually eliminates the flicker normally produced by thin horizontal lines when a Mac's display is converted to NTSC.

Apple 8•24 and 8•24 GC. Apple's 8•24 and 8•24 GC (with both 8-bit and 24-bit output) display cards offer support for NTSC video and do "Apple convolution" to help reduce flicker. This is available only in 8-bit (256 color) mode. The 8•24 GC features an on-board graphics coprocessor that greatly speeds the execution of QuickDraw commands.

Generation X TV Box. The TV Box, a $395 external encoder unit, is an inexpensive way to get flicker-free NTSC video in up to 256 colors (8-bit color) from the Apple 4•8, 8•24, and 8•24 GC display cards.

A similar unit for the same price, the TV Encoder, is available from Computer Video. Other encoder units are also appearing in this price range.

High-End Mac-Image Recording

Models in the $3,000-to-$7,000 range offer power and image quality that is the current state of the art.

ProVideo 32. This RasterOps 232/SFX combo can do overlays and offers RGB input, NTSC and S-video inputs and outputs, and outputs to the Mac display.

RasterOps has introduced two new display boards — the 24S and the 8S — that should work with the Apple 13-inch and compatible color monitors and also support NTSC and PAL interlaced output when teamed with the RasterOps Video Expander. The 24S is available only bundled with the RasterOps Accelerator board. Neither was yet shipping at the time of this writing.

NuVista+. Near or at the top of the heap, Truevision's NuVista+ boards come in three models: the 1M, the 2M, and the 4M. The names indicate the amount of video memory available. NuVista boards can capture, manipulate, and display 24-bit images at up to 756 x 486 NTSC pixels. They offer digitizing, overlay, special effects, and display functions.

Unlike previous NuVista cards, these do on-board encoding and decoding with RGB, composite, and S-video inputs and outputs. They also cost quite a bit less than their predecessors.

For older cards that don't do the encoding and decoding necessary for working with NTSC or S-video signals, Truevision offers the VIDI/O Box, which can convert among RGB, composite NTSC, and S-video.

For video-production applications, NuVista boards are widely considered to be the standard against which other graphics boards are measured, and they are the only Mac graphics boards to have made strong inroads at the broadcast level.

Video Explorer. This new board from Intelligent Resources, still in beta at press time, promises to provide a video switcher on a board that can perform keying, fades, dissolves, wipes, and other real-time effects. It is supposed to ship during the first quarter of 1991.

Flicker and Anti-Aliasing

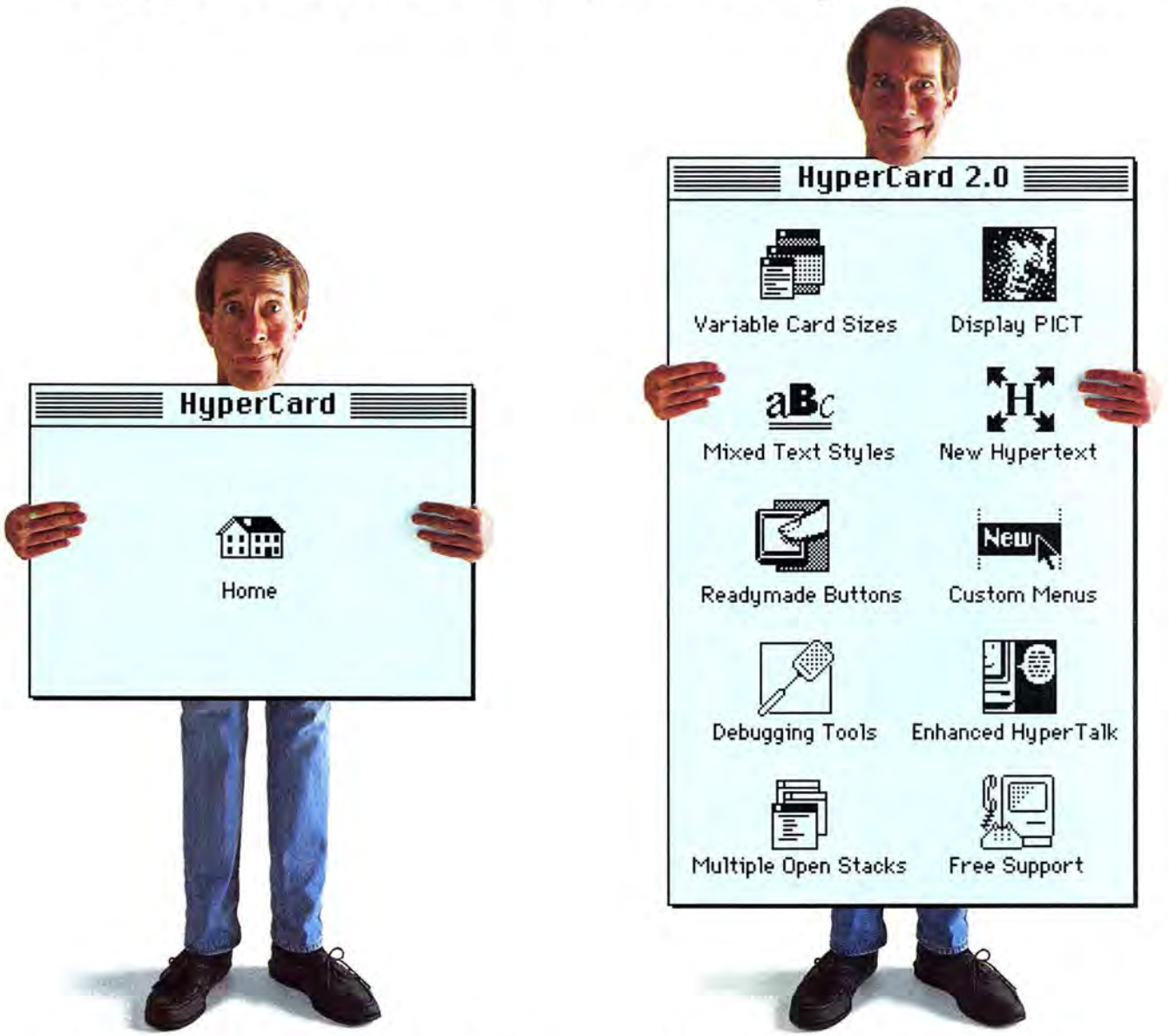
You may have noticed several mentions of hardware that reduces flicker. Flicker can be a major problem when Mac graphics are converted to NTSC and is the reason many people are disappointed the first time they see a Mac graphic on a video monitor. Flicker occurs because the crisp, clean noninterlaced display on the Mac's monitor has to be converted to an interlaced NTSC display and flickering of the fine horizontal lines inevitably results.

Hardware and software solutions can reduce the problem, but carefully designing graphics to sidestep the problem can help greatly — especially if you monitor the NTSC signal as you work.

The problems of flicker and jaggies in diagonal lines and fonts can be greatly reduced by software that performs anti-aliasing — the blending of adjacent colors to provide a smooth transition. Adobe Photoshop, for example, can produce anti-aliased characters that appear much cleaner after conversion to NTSC than normal Mac bit-mapped characters do.

Another factor that sometimes takes people by surprise is the overscanning done on NTSC monitors and receivers. On most NTSC displays, the vertical and horizontal edges of pictures are cut off by the scanning process, by the mask that covers the front of the picture tube, or by both. A graphic image that looks fine on the Mac's screen may be improperly framed on an NTSC display, with the sides, top, or bottom cut off. When designing graphics for

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A Basic Video Glossary

Betacam: professional component-video 1/2-inch recording format using a cassette resembling that of Betamax.

Betamax: a 1/2-inch home-video format developed by Sony, later eclipsed by VHS despite Betamax's higher quality because of Betamax's shorter record/play time and RCA's aggressive marketing of VHS.

blanking: interval during which a CRT's electron beam blanks out while it traces back to the start of the next line (horizontal blanking) or while it traces from the bottom of the screen to the top for the next field or frame of video (vertical blanking).

component video: video-signal-transmission system used in Betacam and MII professional videotape formats. It separates luminance and two chrominance channels to avoid the loss of quality caused by NTSC (or PAL) encoding. Resembles S-video in concept.

composite video: video signal that combines luminance and chrominance signals through an encoding process (such as NTSC) into a single signal that includes both picture and sync information. Composite video is easier to transmit, but picture quality is degraded compared with component, S-video, or RGB signals. It requires decoding before the Macintosh can handle it.

D1 and **D2:** digital tape component and composite formats (respectively) used for professional video recording. D1 costs even more than D2. Both formats can go through dozens—if not hundreds—of generations of dubbing without visible loss of picture quality.

EBU time code: European Broadcast Union version of SMPTE time code.

generational loss: reduction in picture quality resulting from copying video signals for video editing and distribution.

genlock: ability of a device that handles video signals to synchronize itself to an external signal, as for overlaying graphics onto the incoming signal.

Hi8 Video: higher-quality extension of the Video 8 format with higher luminance resolution. It is to Video 8 what S-VHS is to VHS.

interlaced video: the process of scanning video frames in two passes, with each pass painting every other line of the frame onto the screen. NTSC's 525-line frame scans in two fields of 262.5 lines each that take 1/60 second to paint. Thus, each frame takes 1/30 second to paint. See **noninterlaced video.**

MII: professional component-video 1/2-inch recording format, based on a cassette similar to that of home VHS tape.

noninterlaced video: the process of scanning complete video frames in one pass. This usually produces higher image quality than interlaced video produces. The Mac's normal display is noninterlaced.

NTSC: National Television Standards Committee, which defined the 525-line, 30-frame-per-second TV standard currently used in the U.S., Canada, Mexico, Japan, and a few other countries.

PAL: Phase Alternation by Line, the 625-line, 25-frame-per-second TV standard used in Western Europe, India, China, Australia, New Zealand, Argentina, and parts of Africa. Brazil uses PAL-M, a 525-line variant.

RGB: method of transmitting video signals that feeds the basic red, green, and blue channels over separate wires. This provides the highest-quality video signal and is the native format for most computer equipment.

S-VHS: higher-quality extension of the VHS format. It features higher luminance (but the same chroma) resolution. It is to VHS what Hi8 is to Video 8.

S-video: type of video signal used in the Hi8 and S-VHS videotape formats. It transmits luminance and color portions separately, using multiple wires, thus avoiding the NTSC encoding process and its inevitable loss of picture quality. Conceptually somewhat similar to component video. Also known as Y/C video.

SECAM: stands for Système Electronique pour Couleur Avec Mémoire, the 625-line, 25-frame-per-second TV system used in France, Eastern Europe, the USSR, and parts of Africa.

SMPTE time code, or **SMPTE:** Society of Motion Picture and Television Engineers' system of giving each frame of video a unique number to allow indexing and precise tape control. The SMPTE signal is recorded as a modulated audio signal on an audio channel, as a dedicated address track (called Longitudinal Time Code, or LTC), or as a visible digital signal in the vertical-blanking interval above the active picture area (called Vertical Interval Time Code, or VITC). Frames are identified in an hours-minutes-seconds-frames format — 08:12:37:22, for example.

VHS: a 1/2-inch video system developed by Matsushita that has become the predominant home format.

Video 8, 8mm video: the tape format based on the 8-millimeter videocassettes popularized by camcorders.

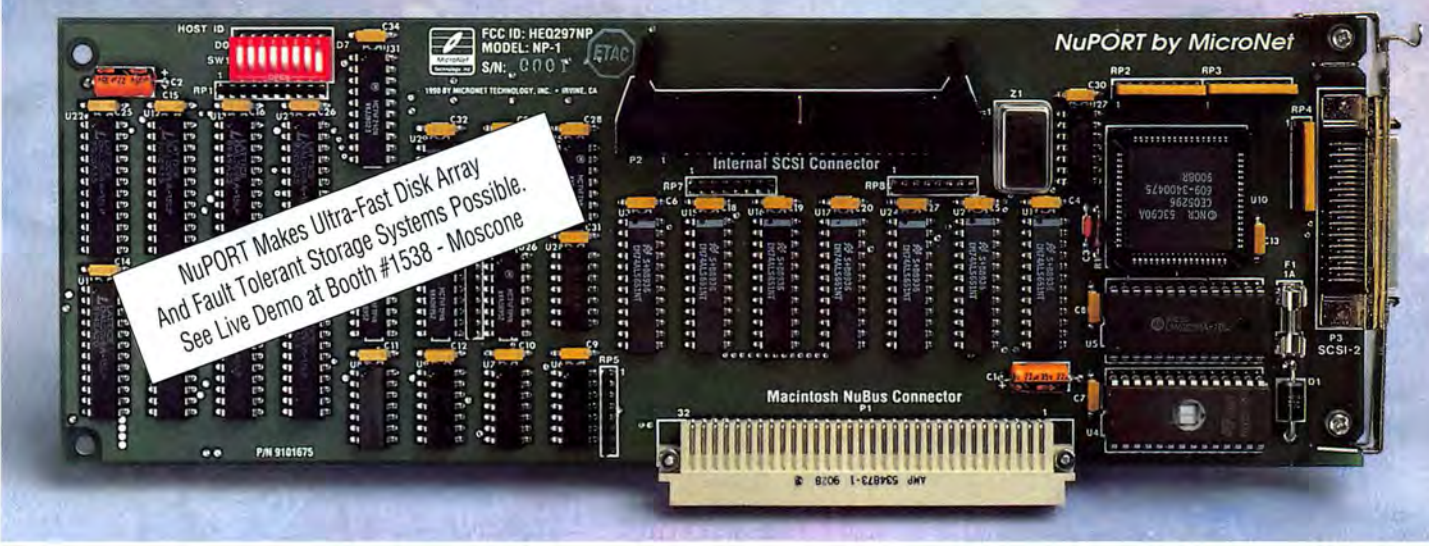
use in a video environment, try to allow for a loss of 10 percent to 15 percent of the image, especially at the sides. The central 85 percent of the picture is known as the "safe title" area.

Device Control by the Mac

Multimedia applications that use the Mac to display live video from an external source virtually require that the Mac be able to control the playback device, whether it is a VCR or a laserdisc player. And because tasks such as creating animation on the Mac often involve long rendering times for each frame, you may also need automated control of video recorders.

Nearly all professional video recorders and high-end laserdisc players today can be controlled serially via an RS-422 port. Fortunately, the Mac's modem port just happens to be one. It's not enough, however, to be able to control a video source; the Mac must be able to index specific frames on a tape or videodisc, a function that most commonly uses SMPTE time code for tapes and index numbers for videodiscs.

VENT Video Master. This external device combines six channels of infrared control of VCRs and laserdisc players with a four-input switcher with two independent outputs. The Video Master can emulate the hand-held remote controls in widespread use with consumer audio/video equipment. Small infrared emitters, linked by cable to the Video Master, sit in front of the devices to be controlled. You put the Video Master into learn mode and use the normal hand-held remote controller with each



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COMPARISON OF SIMILAR PRODUCTS

	NuPORT	PowerCard	ProntoCard
Time to Duplicate 200 MBytes	3:39	9:30	9:58
Time to Load a 30 MB Color File	0:11	0:33	0:37
Suggested Retail Price	*$600	$1295	$1495
True NuBus Bootable Device	Yes	No	No
Disables Built-in SCSI Port	No	Yes	Yes
Multiple Macintosh Support	Yes	No	No
Supports SCSI-2 and 16 Bit SCSI	Yes	No	No
Synchronous Data Transfers	Yes	No	No
Supports Transfers to 4.4 MBytes/s	Yes	No	No
Includes Hard Disk Utility Software	Yes	No	No
On-Board DMA Support	Yes	Yes	No
Shipped With a Matched Hard Disk	Yes	No	No
System 7.0 Compatible	Yes	Yes	Yes
A/UX 2.0 Hard Disk Partitioning	Yes	No	No
Supports Spliced/Overlapped Seeks	Yes	No	No
Supports Synchronized Spindles	Yes	No	No

NuPORT is Sold Only With Matched Hard Disk Drives.

*Additional cost when added with specific MicroNet hard disk subsystems.

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Lt. Carl Oesterle, Navy A-6 pilot

"La Cie drives are the most reliable and convenient disks I've ever had." *James J Haf, Lansing, MI*

"The best survival history of any drive purchased... quietest and most portable." *Al Forster, Dow Chemical*

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Excellent service and support. "I now know why my friends suggested I buy La Cie, their backup and support was exceptionally good. Not only did La Cie provide intelligent articulate instruction and advice but they even called back to learn of my progress." *Richard Woudenberg, Ridgewood, NJ*

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Tsunami actual size including universal power supply, silent fan and external termination switch.

"When I called La Cie, I was told someone would call me back. Would you believe after a few minutes, they called back?! Other calls I had made previously to La Cie were also returned promptly. The customer service and technical support people were patient and friendly." *Rick Monteverde, Honolulu, HI*

The experts agree. "Service star La Cie has up to a five year warranty, toll free support and guaranteed turnaround time for repairs. La Cie comes out on top in service and support." *Macworld, June 1990*

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Increased performance. "I love your Tsunami drive! It's fast, quiet, small and light and I can't emphasize how wonderful it is to turn the termination on and off. Of course, it doesn't hurt that you bundle Silverlining with it–the universal formatter with no competition that I know." *Johnathan Braun, Palo Alto, CA*

The experts agree. "La Cie offers the leading combination of software and performance." *Macworld, March 1990*

MacUser Labs show that La Cie drives are at the top of the pack in raw speed, best real-world performance, coolest temperature, quietest noise, and longest warranty (five years). *MacUser, February 1990*

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"I create advertisements for movies. La Cie's Silverscanner has enabled us to sell a lot more jobs! Two thumbs up!" *Dave Works, Los Angeles, CA*

"I love these drives. The size is perfect, the response time is great, these are the best drives money can buy. I have searched and compared price, quality and performance with other products. La Cie is the best." *Edwin E. Rivera-Juan, Hato-rey, PR*

The experts agree. "If you are value conscious you'll be hard pressed to beat La Cie." *Macworld, November 1990*

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device, and the Video Master records and stores the correct protocol in your Mac. Thereafter, you can control all the devices from the Mac.

Each input handles NTSC video and two audio channels. The Video Master connects to the Mac's modem port and can be controlled by HyperCard, MacroMind Director, or the DA supplied by VENT.

You can use Video Master to do video editing with consumer VCRs, laserdisc players, and other NTSC sources. Even vaguely accurate editing is difficult, however, because of the highly variable accuracy and control capabilities of consumer VCRs.

Top-of-the-line consumer VCRs offer sophisticated tape-handling functions, but the remote controls of the average consumer VCR were not designed for editing. Even if the controls let you find the exact frame you want to edit, the VCR onto which you're recording must also have flying erase heads (which erase the existing video a frame at a time) or the edits won't be clean.

On the other hand, as a multimedia controller, the Video Master works very well, although the welter of cables needed may cause you to rearrange your equipment. The ability to select signals from and control the playback of four sources offers great possibilities for creating sophisticated presentations.

Equip a conference room with a Mac sporting an NTSC-video card, laserdisc player, VCR, and Video Master, and you've got the basic hardware to present professional multimedia productions. At $599, Video Master costs less than many consumer video/audio routing switchers, and it does far more.

DQ-Animaq. Diaquest's DQ-Animaq moves you up a step in production quality, with frame-accurate animation control of industrial and broadcast VTRs. It has an on-board SMPTE/EBU time-code reader/generator and can be used to trigger a digitizer for video-frame-image capture and to control VTRs for recording Mac images.

The DQ-Animaq Broadcast Model supports all serially controlled VTRs, including broadcast 3/4-inch, Betacam, MII, 1-inch, and digital machines. The paradoxically higher-priced Desktop Model supports industrial 3/4-inch, VHS, and S-VHS machines, which require parallel control.

VLAN. Videomedia's VLAN system is a local-area network that lets the Mac control up to 32 video devices, including videotape and videodisc recorders and players. An external master transmitter connects to the Mac's modem port, and individual device interfaces plug into the master transmitter with standard video cables. The VLAN control signal may be looped out of the first device interface and extended to additional interfaces, in a manner similar to SCSI devices.

MacVAC. The MacVAC from Advanced Digital Imaging is an animation controller that controls both a videotape machine and Truevision NuVista boards. This setup lets it perform functions such as unattended assembly of animated scenes and processing of up to eight frames at a time. For serially controlled machines, it's a software-only system (except for the supplied cable). For parallel machines, a NuBus board that doubles the price is included.

IMTX 8000. From Interactive Media Technologies comes the IMTX 8000, a stand-alone box with its own processor and bus that receives instructions serially from the Mac's modem port. It can be configured, via plug-in cards, to control up to eight video devices and perform switching and monitoring functions.

In addition to handling multimedia applications, the IMTX 8000 can act as a complete video-editing system. Analog and digital effects boards will be available to perform switcher functions, and Interactive Media Technologies plans to offer MIDI and SCSI control boards. A system for controlling four devices — three VTRs and a switcher, for a basic A/B-roll editing system — will cost $8,000 to $9,000. It should be available as you read this.

Video F/X. Digital F/X's $9,995 Mercedes-Benz of black boxes is an integrated video-, audio-, and graphics-editing system that should be available commercially by the time you read this. It connects to a NuBus video-frame-buffer card. The box contains a video and audio switcher and a keyer and provides VTR-control functions. The frame buffer lets the Video F/X software display and store the first frame of a selected video clip. Thus, you work with images rather than with SMPTE time-code numbers while editing. Video can also be digitized in real time and recorded on-disk.

The video switcher can execute dissolves and wipes between two video inputs, and the audio switcher provides three stereo inputs. The hardware can control three VTRs — two source and one recording — although the software can presently control only one source VTR in addition to one recording VTR.

Digital F/X is the first company to license PostScript for NTSC output. The Video F/X system includes an interactive titler that can superimpose anti-aliased graphics over live-action video.

Avid/1 Media Composer. Priced from $60,000 to $80,000 and pushing the limits of Mac technology, the Avid Technology Avid/1 Media Composer stores digitized video and sound on hard disks to provide nonlinear, random-access video editing. The digitized images are small and a bit grainy but are generally adequate for off-line editing, in which you make a rough cut of the material. CD-quality sound lets you edit the sound on-line for final layover to edited videotape master. Once the rough cut has been approved, the Avid system can also control a source and a recording VTR for cuts-only assembly of an editing program.

Video Sources

Given that much of interactive multimedia depends on a video-source signal, you need to determine how source material will be created and accessed.

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Many people might be surprised to learn that interactive technology goes back to the mid-1970s, if not earlier. For at least 15 years, interactive video has been "just around the corner." Every year video and training publications have promised that "next year will be the Year of Interactive Video!"

The problem, until now, has always been that videotape is a linear medium. You have to shuttle around on the tape to get to various sections, which nearly always takes too much time. Interactive applications require random access, which currently can be delivered exclusively by videodiscs.

Videodiscs

The videodisc is an analog image-storage medium that uses technology similar to that of audio compact discs. That's why you can get players that can handle both media.

Videodiscs come in two varieties: CAV (constant angular velocity) and CLV (constant linear velocity). Each can be read by any videodisc player. The difference is that CAV discs store one frame per revolution, which facilitates still-frame and slow-motion effects and the process of finding particular frames rapidly, as multimedia applications generally require.

CLV records tracks of equal length contiguously, regardless of where they fall in the CLV's single spiral track. The trade-off is that CAV discs limit you to half an hour per side, whereas CLV discs give you a full hour per side. The latest machines contain frame buffers that can provide for still-frame and slow-motion effects even with CLV.

The problem with videodiscs has been that in small quantities, they cost a lot to produce, but prices have been coming down in recent years. Today, it's possible to have a single LaserVision-compatible disc — called a check disc — pressed for $100 to $125. A single distribution-quality disc costs about $360, and a thousand distribution-quality discs will run you about $10 each. 3M Optical Recording in St. Paul, Minnesota, is the premier company that offers videodisc-mastering and -replication services.

3M requires a 1-inch Type C (broadcast format) master tape to make laserdiscs from videotaped material. If your original material or edited master is in another format, you'll have to transfer it to Type C first. For interactive presentations, there are several other stringent technical requirements as well.

Pioneer Electronics in Los Angeles also produces laserdiscs, but this service is available only to those who require large quantities.

But mastering and replication costs pale next to what it takes to design and produce an interactive videodisc. If you hire a production company that specializes in creating interactive programs, a very simple, straightforward production of 15 to 20 minutes' duration will probably cost around $50,000. For a sophisticated production, involving multiple levels of branching and interaction and including all production costs, your budget should be between $100,000 and $250,000.

Videotape Technology

Slow shuttle speeds severely constrain the use of videotape in interactive applications. But if you don't need instantaneous response times, videotape offers considerable advantages. It's relatively cheap to produce, and even single copies are easy to duplicate.

Many industrial and all broadcast VCRs can be controlled via a Mac's serial port, with SMPTE time code for achieving frame accuracy.

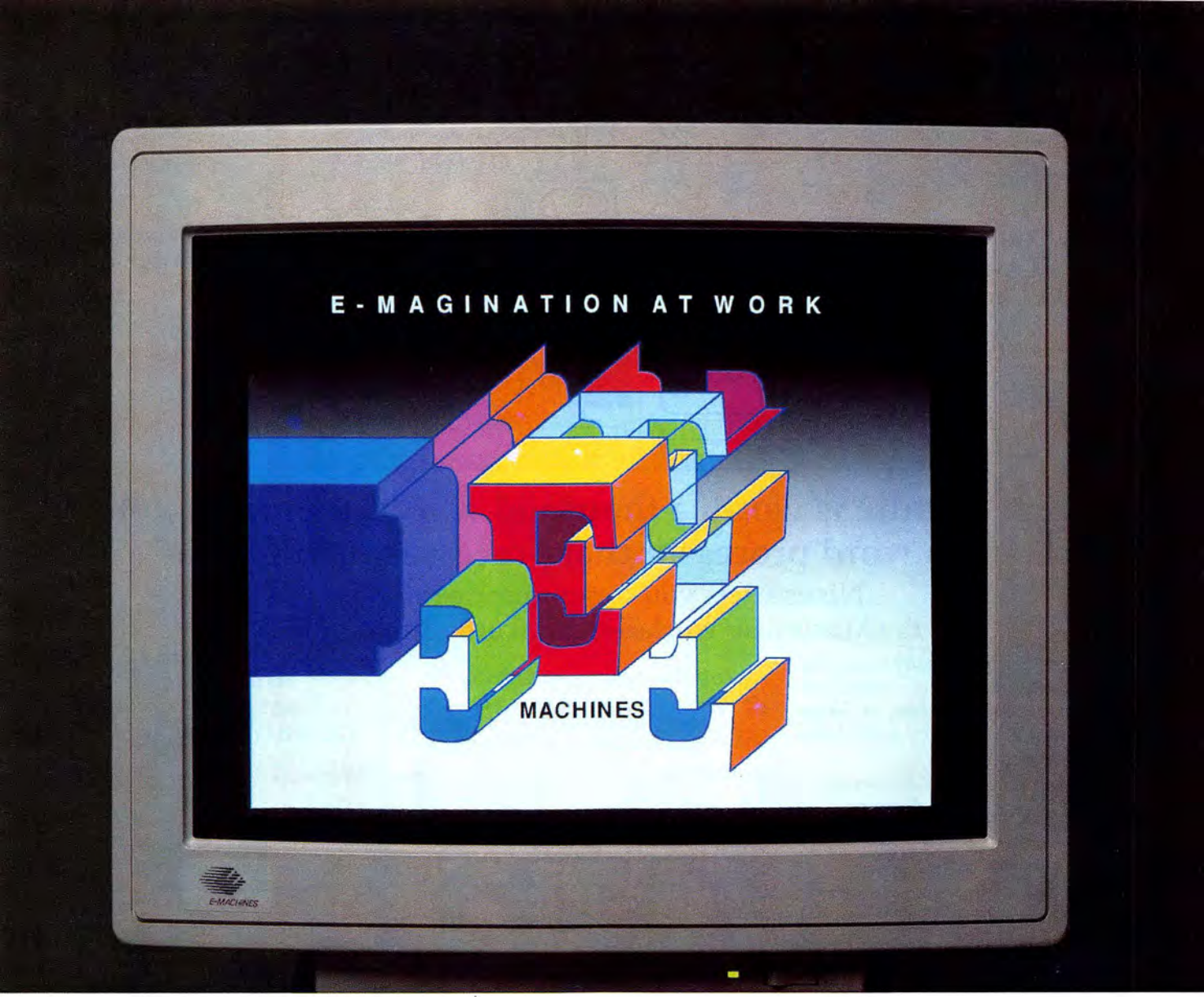
NEC PC-VCR. One company — NEC — has addressed the needs of interactive applications with an S-VHS recorder designed especially for use with them. The NEC PC-VCR offers relatively fast (two-and-a-half-minute) shuttle times on T-120 tape; can be controlled via an RS-232C serial port (an easy conversion from the Mac's RS-422 modem port); and offers frame-accurate access through special coding of the tape's control track, which can even be added to existing tapes. Best of all, it will include special Macintosh software when it ships, which should happen before you read this. Its $2,100 price brings the cost of professional-quality VCRs (remember, you'll probably need two) within the reach of mainstream companies as well as multimedia-production houses.

Displays for Multimedia

Multimedia technology is ideal for presentations, and presentations are often given to groups too large to cluster around an SE's monitor. The three most common displays for group presentations are large-screen CRT monitors, video projectors, and LCD overhead-projection panels.

Direct-View Monitors. The largest direct-view CRT monitors currently available are the 37-inch units available from several manufacturers, using a Mitsubishi tube and generally priced around $6,000. Sony does make a 42-inch monitor, but the price is vastly higher than the prices of the smaller ones. The 37-inch monitors come with RGB inputs; have multiple scan rates; and provide a large, crisp display. Their size and weight — much more than 100 pounds — make them most suitable for use in permanent installations such as company conference rooms.

Video Projectors. Video projectors come in a variety of forms and use many different technologies. One of the two most established types uses three projection tubes driven by specialized CRT screens encased in mirrored enclosures. These use the same technology as most home-projection systems but are front-projection designs rather than the rear-projection design employed in most home systems. Barco, Electrohome, Panasonic, and Sony are



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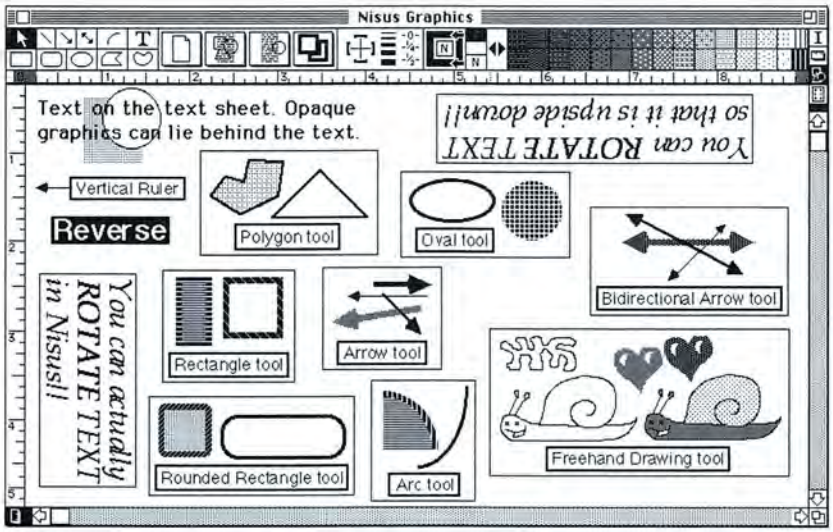
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If a picture is worth a thousand words, then why not use a word processor that processes pictures too?

Nisus® lets you communicate the way the Macintosh works—with words and graphics

Most people aren't really interested in whether a program is a word processor, a graphics program, or a page layout program. All they really want to do is communicate.

Sometimes, something as simple as a note with an arrow attached is all you need to make your point.

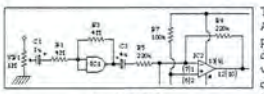
Nisus lets you draw attention to electronic symbols or scientific notation. Text wraps around your callout box automatically.

Other times, a little grey background behind some text seems more appropriate. The tools you need to communicate come built into Nisus, or you can place a PICT graphic like the features list on the right.

You can "Place" any page of a Nisus file containing text and graphics into another Nisus file where it becomes a picture called a "Placed Page Graphic." Double clicking this "Placed Page Graphic" will open the original file for editing. Graphics can be drawn or pasted to three different layers: the text layer, behind the text, and in front of the text, giving you total control.

Nisus lets you rotate text, which is very important if you are designing a self-mailer that folds into three panels. Nisus also enables you to print two pages up—pamphlet style. So, for example, suppose you want to print two pages on a single 8 $\frac{1}{2}$ by 11-inch sheet of paper turned sideways. You can do it with Nisus by a simple selection. Perhaps more important, however, is that this same command will collate your pages—in an 8 page document, for example, page 1 and page 8 will lie next to each other!

CIRCUIT DIAGRAMS IN A NISUS® DOCUMENT



This is a Laser TechFonts[1] diagram. As you can see, you can put a complicated diagram directly into your document. In this case, the diagram was drawn using specialized "draw" circuit fonts, along with the Scientific text fonts. These special fonts allow you to design a schematic quickly, using a draw or paint program, or a word processor with integrated graphics, such as Nisus®, the amazing word processor from Paragon Concepts, Inc.

FIGURE 1A

SCIENTIFIC EQUATIONS WITHIN A NISUS® DOCUMENT

This is a section of Laser TechFonts[1] within a Nisus document: $\frac{11}{12}x^2(x^2-x)^3$. The first part of the equation, $\frac{11}{12}x^2$, is an example of the Fraction font, which allows a fraction to be typed on one line of text. The exponent 2 in the numerator is Fraction superscripted. The second part of the equation, $(x^2-x)^3$, is an example of the Scientific font, with the exponents 2 and 3 in the SuperScientific font.

You can type equations into Nisus using Laser TechFonts, and then put boxes around them. These boxes, drawn using the Nisus graphics palette, call attention to examples and formulas. This feature is perfect for writing manuscripts, exams and study guides.

$$\beta = \frac{\sum_{i=1}^{n} X_i Y_i - k\left(\sum_{i=1}^{n} X_i\right)\left(\sum_{i=1}^{n} Y_i\right)}{\sum_{i=1}^{n} X_i^2 - k\left(\sum_{i=1}^{n} X_i\right)}$$

FIGURE 1

If you're new to the Macintosh word processing market, you probably want a word processor that is easy to use. If you've been around for a while, you undoubtedly want a powerful word processor. Chances are you have tried either MacWrite or Microsoft Word. 4.0. One is easy to use, the other offers power. Both, however, have severe limitations which is why we developed Nisus in the first place.

Nisus has a built-in word processing language which does for word processing what built-in languages do for databases. For example, the language allows you to develop routines to index all proper names, a method to find and correct all double words, periods, and extra spaces, or index every word in a document except those you specifically want to exclude. You choose the features.

Discover why Nisus is shipped with every Macintosh in Korea, why *MacUser U.K.* named Nisus "1989 Best Word Processor," and why *Macworld Australia* uses Nisus as its word processor of choice.

This two column format above is actually a separate Nisus file placed into the master file. This gives you total control over how you layout a Nisus document.

Nisus Feature Comparisons	NISUS 3.0	Word 4.0	WriteNow	MacWrite II
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Noncontiguous text selection	■			
Unlimited column formats	■			
Find and replace or index	■			
Find any font, *style*, size, or color	■			▒
Place text or graphic linked to parent text or graphic file	■			
Find and replace in unopened files	■			
Cross reference text	■			
125,000+ user definable key commands	■			
"Super Style sheets"	■			
Automatic File Comparison	■			
10 editable clipboards	■			
Mark text as electronic book mark	■			
Built-in Graphics	■			
Rotate text and graphics	■			
Unlimited undos back to "open file"	■		▒	
Reads and Writes Microsoft Word Files	■	■	■	■
Vertical Ruler	■			

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> ***MacUser***



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*Not compatible with Macintosh 128K or 512K machines.

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among the suppliers of these systems.

The other established type is the GE light-valve projector, which uses a projection bulb to produce a brightness level sufficient for large images and for use in auditoriums or small theaters.

The newest designs use LCDs to create the projected image. Early models produced grainy images, but the latest units, such as the Sharp XG-1000, produce excellent displays over a range of sizes and viewing angles. The Sharp projector doesn't need convergence adjustment whenever it is set up. The price matches that of 37-inch CRT monitors.

LCD Overhead-Projector Panels. This relatively new product category has exploded in the past two years, with units available from a wide range of suppliers. Although the earliest LCD overhead-projector panels were gray-scale systems, lately color panels are being offered by many suppliers.

For instance, In Focus Systems offers the compact, lightweight 5000CX PC Viewer, which, despite its name, works with Macintosh II computers as well as those from the other camp. Using three sandwiched panels, each capable of producing 17 hues, the 5000CX can reproduce 4,913 colors, which allows it to virtually match the number of colors on the Macintosh's screen although not their intensity. Again, the price hovers around the $6,000 mark.

Interactive Presentations

Large displays let you run a multimedia production in front of a large audience, but they create another problem: How do you control the presentation while standing far away from your Mac? Enter Proxima, another vendor of color LCD overhead-projector panels, which has developed a system called Cyclops. You can aim its pointer at a large projection screen and use it to point and click just as if you were handling a mouse. A small video camera mounted on the LCD projection panel picks up the image of the pointer's LED positions on the screen.

As with so many of the products discussed in this Buyer's Guide, it should be available by the time you read this.

The Final Cut

As you can see, much video gear has appeared for use on the Mac, and much more is coming. On the other hand, putting together a full audio/video Mac-based multimedia system will take you where few current Mac users have gone before.

Problems abound. The software needed to fully and seamlessly integrate video on the Macintosh has appeared only in bits and pieces. Early users have complained about poor image quality, although some of these complaints are the result of unrealistic expectations. Multimedia applications — especially interactive ones — cannot yet be based on a large body of experience in the form of books, specialists, and interactive multimedia training applications about interactive multimedia. Few Macintosh dealers are knowledgeable about video.

Similarly, few video dealers — professional or otherwise — are experienced with computers. Even fewer of either know much about multimedia. And when you try to justify acquiring multimedia equipment to the holder of your purse strings, you'll run into lots of questions you'll be hard-pressed to answer without getting the equipment and developing the applications that prove that getting the equipment made sense. So you're pretty much on your own, pal.

But each year, more and more Macs show up at the National Association of Broadcasters' annual trade show, and at each Mac Expo, more and more video devices are in evidence.

It's enough to make a Macintosh user want to stay tuned.

Lon McQuillin is a television producer/director/editor, author, teacher, and software designer who spends his copious spare time thinking about writing novels.

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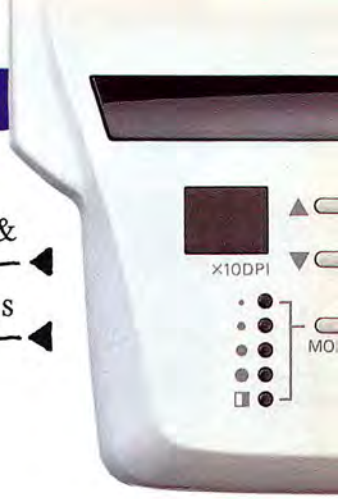
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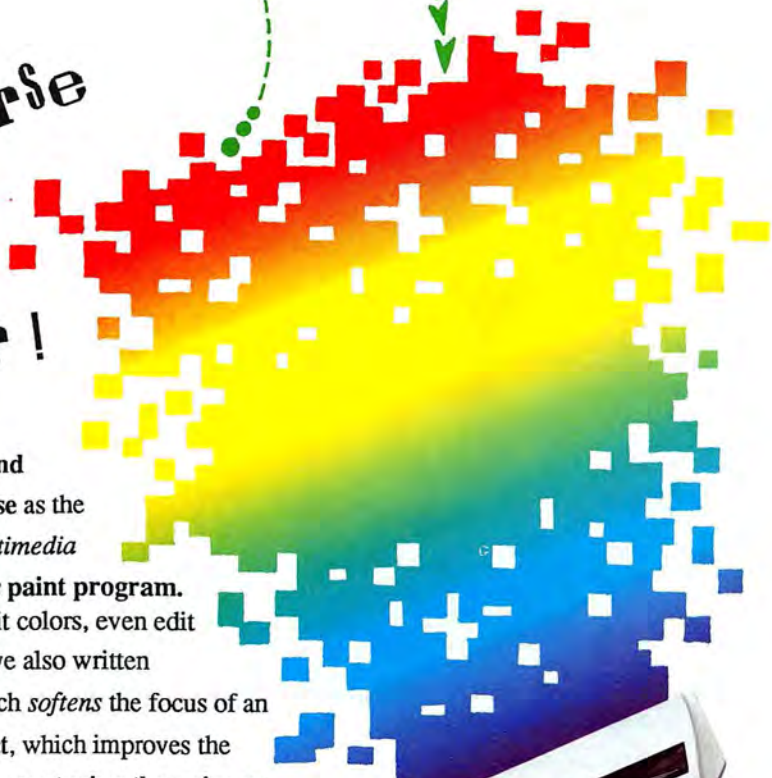
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Vertical refresh	75	78	75	74
Pop-up menus	Yes	Yes	Yes	Yes
Enlarged menubar	Yes	Yes	Yes	Yes
Enlarged cursor	Yes	Yes	Yes	Yes
Screen saver	Yes	Yes	Yes	Yes
Screen copy	Yes	Yes	Yes	Yes
Full year warranty	Yes	Yes	Yes	Yes
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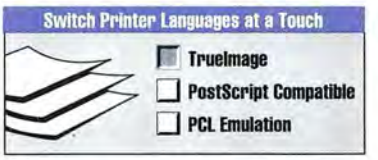


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BY KEN GRUBERMAN AND LON MCQUILLIN

MULTIMEDIA AND AUDIO

From the introduction of the earliest Macs, superior audio has pointed the way to multimedia applications. Now sound on the Mac is moving from wonderful toy to effective tool.

Figure 1: MIDI devices such as keyboards communicate with the Mac via a MIDI interface connected to the Mac's serial port(s). Additional MIDI devices such as samplers, expansion-unit synthesizers, and effects processors can also be driven via a MIDI loop-through chain.

The Mac can be equipped with a NuBus synthesizer and a digital-signal processor that lets it record digital audio directly onto hard disks. With the MacRecorder, the sound can be recorded on standard Macs, and self-powered speakers give the Mac a more powerful sound.

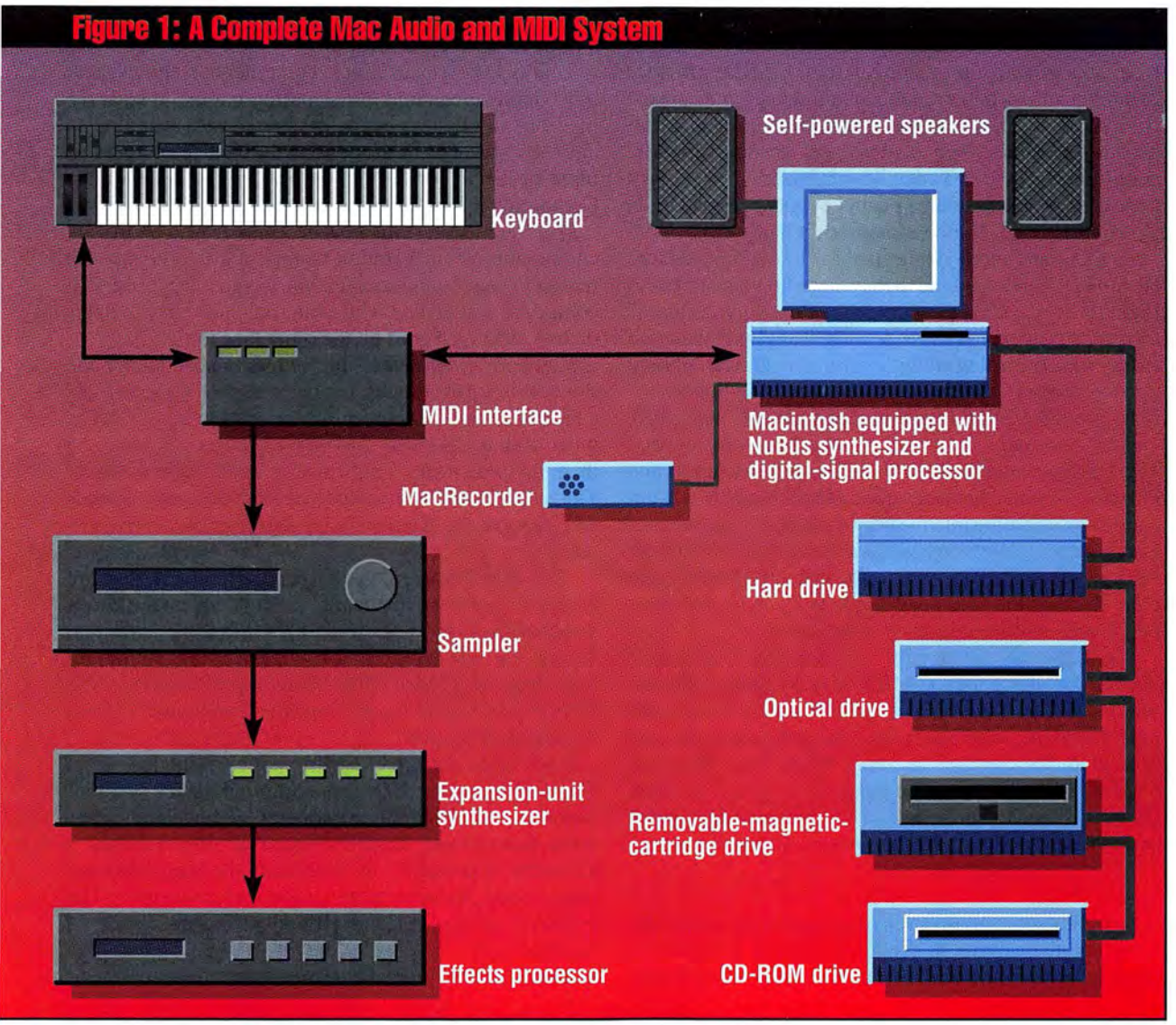
Audio recording requires prodigious disk capacities, leading to the need for large hard disks, optical drives, and 44-megabyte-cartridge drives for transporting files. CD-ROM drives can be used to load sampler data files from CD-ROM discs and digital audio from CD libraries.

The creators of the first Macintosh recognized the importance of sound. Every Mac ever made has had built-in sound at least as good as that of a decent monophonic AM radio. You can add sound to Mac multimedia applications more easily and cheaply than you can add video, animation, or any other enhancement.

Sound on the first Macs was of high fidelity only in comparison with DOS machines' beeps and squawks, but the Mac handled speech well enough. Musicians then took the Mac and made it their own, adding tremendous capabilities in the process. The Mac became such a studio standard that even mammoth Synclavier, a leading synthesizer vendor for the pros, abandoned its proprietary interface for that of the Mac. By 1990 a profusion of Mac-based music hardware and software at all price levels was available.

Recently, sound on the Mac has gotten even better, suitable for general users rather than just for musicians. Stereo-sound-output ports now come standard with every Mac except the LC,

Figure 1: A Complete Mac Audio and MIDI System



which has a mono-output port. The LC and IIsi come standard with sound-input ports and microphones as well, and with third-party products, you can add sound-input capabilities to other Macs.

Having so much sound capability standard on new Macs is encouraging vendors to develop even more sound products for the Mac. For example, a variety of CD-ROM drives include audio-CD facilities. Dropping prices have brought them within the reach of average Mac users, and you can now buy many CD-ROM-based interactive applications and even application-building tool kits. In addition to generating sounds, the Macintosh has become the musician's instrument of choice for controlling MIDI (musical-instrument digital interface) devices. This industry-standard protocol gives the Mac the ability to conduct virtual symphony orchestras.

This section of the Multimedia Encyclopedia looks at applications, tools, and techniques for integrating sound into multimedia applications on the Mac.

MIDI

Musicians make music with Macs via MIDI. A kind of local-area-network protocol for sound, MIDI provides communications paths among instruments, synthesizers, computers, and playback equipment (see Figure 1). MIDI became possible when synthesizers became digitally controllable devices. Today's synthesizer is, in reality, a dedicated computer with a piano keyboard instead of an alphanumeric keyboard (sometimes it has both).

As more and more synthesizers with MIDI interfaces became available and inexpensive studio gear started to flood the market, the phenomenon of the "home studio" arrived. It is now possible to do almost anything that used to require a recording studio — from vocal overdubbing to film scoring — at home, with everything linked to a Mac through a MIDI interface that costs less than $100.

Prices for MIDI interfaces for the Mac vary widely. The simplest interfaces, such as those from Apple and Passport Designs, provide single MIDI-in and MIDI-out connectors and plug into the Mac's modem or printer port (see Figure 2). High-end MIDI interfaces sport multiple ins and outs, SMPTE-time-code synchronization, and other features the pros need. Opcode Systems and Passport Designs offer interfaces at this level.

The MIDI specification provides for up to 16 channels of communication among MIDI devices. Many high-end interfaces double this capacity to 32 channels by using the Mac's modem and printer ports simultaneously. Beyond even that, Mark of the Unicorn's MIDI Time Piece can handle 128 channels and be ganged for up to 512 MIDI channels. Time Piece includes a DA that provides control and that can serve as a MIDI merger and patch bay.

Sampling

Sampling is the digitization of analog music sources by sampling the source at frequent enough intervals to (hopefully) fool the human ear. This is how consumer audio-CD players work, sampling the analog signal at 44,000 or so times a second.

This approach takes a lot of computer horsepower, and most applications that use sampling require at least the power of an SE/30. You can get started with sampling on any Mac, however, by using either the built-in microphone input of the LC or the IIsi or devices such as Farallon Computing's MacRecorder with other Macs.

MacRecorder Sound System. This hardware/software combination from Farallon Computing is probably the most familiar sound application to most Mac users. It comprises a small box with a microphone and two inputs on one end and a cord on the other (see Figure 3).

You hook it up to the Mac's modem port, launch the SoundEdit software, and start recording. Or you can route a tape recorder, CD player, or turntable to it; snip off as much sound from your favorite source as you like; and then integrate it into your favorite application or stack. This is the most likely source of all those funny sounds you've no doubt heard coming from your hacker friends' machines.

But MacRecorder also has many features that are useful in business applications. You can attach voice annotations to specific locations in memos. Businesspeople have been routinely using SoundEdit files along with MacroMind Director presentations. And HyperCard users have benefited immensely from MacRecorder as well.

You can actually build your own low-cost MacRecorder-type SID, or sound-input device, with inexpensive off-the-shelf components by downloading the plans from Zmac. This collection of files includes a hardware schematic (in MacPaint format), software source code, documentation, and a test application. The features of this SID digitizer resemble those of MacRecorder.

MacRecorder Voice Digitizer. This budget version of

Figure 2: MIDI Interfaces



Figure 2: MIDI interfaces let the Mac exchange data with synthesizers and other MIDI devices. Low-cost interfaces such as Apple's provide simple MIDI-in and MIDI-out connections for the 16 basic MIDI channels. High-end units can connect to both the modem and printer port to provide 32 or more channels, and they commonly provide port switching and the ability to read and write SMPTE time code.

Figure 3: Capturing Sounds Inexpensively



Figure 3: Farallon's MacRecorder offers an inexpensive method of recording sounds directly to Mac disks at sampling rates of up to 22 kilohertz (half the rate of CDs) and at 8 bits (versus the 16-bit resolution of CDs) — good enough to sound great. Two MacRecorders can be used together for stereo sampling. The new Mac LC and IIsi have sound-sampling capabilities built in and are supplied with microphones.

MacRecorder forgoes the input jacks and gain-control knob of the original. Voice Digitizer is designed to meet the needs of network voice mail and audio notes.

Synthesizers and Samplers

Before sampling technology reached the mass market, synthesizers had to create sounds by using oscillators, filters, and amplifiers. The results fell far short of the richness that pours out of a well-played Stradivarius, to say the least.

Nowadays many synthesizers create sound via sampling, which provides better sound along with considerable latitude for altering it. You can, for example, sample a dog's bark and then shift the bark up and down the scale.

Synthesizing a sound takes little or no memory, whereas sampling and storing it takes a lot, so low-cost synthesizers often use a combination of sampled and synthesized sounds. For instance, a violin sound may start with a sample to provide the initial attack of the bow and then blend smoothly into a synthesized sustain; this provides realistic sound while conserving memory.

Sound Exciter. The least expensive synthesizer of all is your Mac. Just buy Passport Design's Sound Exciter software, which turns your Mac into an eight-voice, polyphonic, multitimbral synthesizer. Sound Exciter comes with an "orchestra" of voices ready to use. The software is also compatible with MacRecorder and Studio Session and Jam Session files. Sound Exciter works with any Apple MIDI Manager-compatible keyboard or sequencer.

The sound quality doesn't approach that of a stand-alone synthesizer, although piping the output to an external amp and speakers helps a bit. At any rate, Sound Exciter can certainly suffice for learning or for creating presentations in which audio fidelity isn't critical.

Black-Box Synths. Mac users don't have to buy large, expensive, keyboard-equipped synthesizers. Many synths are keyboardless black boxes you can control through sequencer software running on a MIDI-equipped Mac. Popular examples include the Yamaha TX series, Kurzweil 1000 series, Korg M1 Rack, Roland D-110 and U-110, and E-mu Systems' Proteus modules. They range from about $500 to $2,000. Magazines such as *Keyboard* and *Electronic Musician* regularly feature useful comparative reviews on the pros and cons of these and other synths.

These black boxes can link up, via MIDI, with other modules and keyboards, so you need only one keyboard per system — or perhaps just a music processor on your Mac.

Higher prices get you full digital-sampling synths, often with their own storage and sample-editing capabilities, that you can use to create realistic sound effects. Examples include the Akai S-900 and S-1000; Casio FZ-1 and FZ-10; E-mu Systems' Emax; and units from Ensoniq, Studer, and Roland.

Editors and Librarians

Most low-cost synths let users blend samples and synthesized sounds to create new sounds called voices, or patches. Patch editors for the Mac make this chore easier than twiddling a synth's LCD displays and controls.

Patch editors typically include librarian functions and are available from companies such as Opcode Systems, Valhala Music, and Dr. T's Music Software. They generally cost around $100.

One good stand-alone librarian is Opcode's Galaxy. It works with more than 70 MIDI devices, giving synth users an easy way to access any sound bank or find any sound. It also remembers where sounds are located on multiple keyboards. Galaxy interfaces with sequencing software to route sounds to specific MIDI channels.

For full samplers, editing software becomes even more

powerful, letting users edit, clean up, and modify sounds and their underlying waveforms, using the Mac's graphic display. The Mac can also serve as a sample librarian, receiving samples from the sampler, storing them, and sending them back to the sampler. Editing software includes Digidesign's Sound Designer II SK and Passport Designs' Alchemy and its junior version, Sound Apprentice. Prices range from a few hundred dollars to double that.

Sequencing Software

Sequencing programs turn your Mac into a MIDI version of a tape recorder and a player piano. They record, store, and manipulate MIDI data in numerical form or in music notation.

Popular sequencers include Opcode Systems' EZ Vision (see Figure 4) and its upscale sibling Vision, Passport Designs' Audio TRAX and its upscale siblings Master Tracks Pro and PRO 4 (see Figure 5), and Mark of the Unicorn's Performer. The high-end products let you combine audio with video by providing SMPTE-time-code synchronization when you use them with SMPTE-to-MIDI interfaces. Costs range from a few hundred dollars to double or triple that.

Sequencers deal with sound as MIDI data. Musicians generally record one track at a time, as they would with a multitrack tape deck. Each track can represent a different instrument. You can play back recorded tracks as you lay down new ones, which helps a lot.

With a sequencer, you mold sounds at will. You can change a note's duration, correct timing errors (called quantizing), add pitch bend, and control volume and stereo panning, for example. At any point, you can play back part or all of anything you're working on.

Studio Vision. Opcode Systems' Studio Vision, designed to work in conjunction with Digidesign's Audiomedia or Sound Tools digital audio hardware, lets you integrate MIDI sequences with digital audio tracks stored on your Mac's hard disk and simultaneously edit both. The mixing and shaping of sounds is totally automated, as are the recording, editing, and playback of two independent digital audio tracks. This approach offers tremendous flexibility: Dump all the synth sounds into the Mac, and play from there, or keep the synths and the Mac running together for even more flexibility.

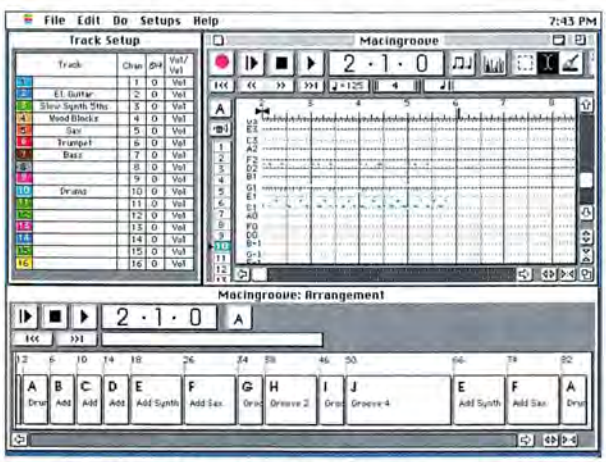


Figure 4: Opcode's EZ Vision is intended for amateur and hobbyist musicians and is upwardly compatible with Opcode's professional-level Vision and Studio Vision programs.

Live List. A program that comes with Master List from Digidesign, Live List lets users perform all of Studio Vision's functions in real time. It lets you play digital sounds on the Mac directly out of applications, and you can convert 16-bit-stereo samples to the more-familiar snd resources and then play them through any Mac speaker. Thus original sound productions can be attached to anything from a HyperCard stack to a Director movie.

Audio TRAX. In a similar vein but at a much lower cost, Passport Designs' Audio TRAX is an enhanced version of the company's Trax sequencer. It adds the ability to record, edit, and play back two channels of 8-bit sound in sync with MIDI data.

Audio TRAX works with MacRecorder or a sampling synthesizer. It uses the Mac's built-in sound circuitry to generate sounds and lets you add sound effects and dialogue to sequences.

Notation Software

Notation programs are sheet-music processors. Most also have MIDI playback capabilities; these include Electronic Arts' DeluxeMusic Construction Set (DMCS), Passport Designs' Encore, Mark of the Unicorn's Professional Composer, and Coda Music Software's Finale. Coda also publishes a scaled-down version of Finale called Music Prose.

All of these notation programs provide electronic sheet music on-screen. You can play compositions on a synth and print out scores. You can also import standard MIDI files from most sequencers into notation software to have the files transcribed into standard music notation. All the companies use the Adobe Sonata PostScript font, except for Coda, which claims to produce superior results from its proprietary Petrucci PostScript font.

Notation software starts in the $100 range with DMCS. Music Prose costs about double that, and the other, professionally oriented products cost $500 and up.

MIDI Records

Those with limited or nonexistent composing skills can still incorporate music into their multimedia applications by using MIDI "records" (see Figure 6). Pioneered by Passport Designs, these are compositions recorded in MIDI format on Mac-readable disks. You can play them via synth with your sequencer software, which also means you can rearrange them, change keys, and generally manipulate them at will.

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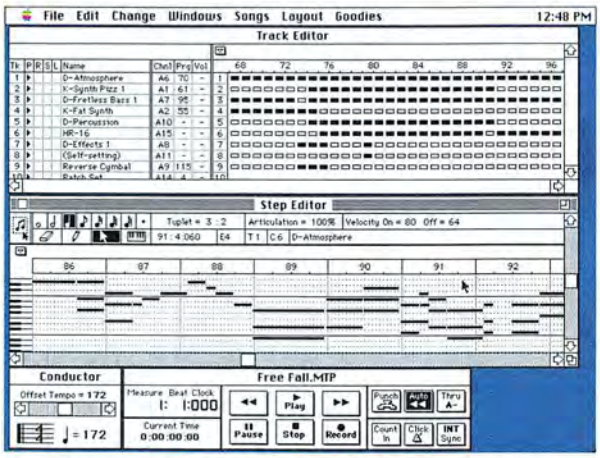


Figure 5: The Track Editor window (upper window) of Passport Designs' PRO 4 makes it easy to work on large sections of a song; the Step Editor (middle window) lets you work on individual notes. At the bottom are the Conductor (tempo) window and the Transport window.

educational applications. Don't forget that you may owe royalties if you do so, though.

Passport's new Music Data Company division has brought out a catalog of MIDI music. The initial catalog comprises twelve 800K floppies. Genres include rock and roll, R&B, country, jazz, and classical. The classical disks have two cuts each, the rest have three. Designed to be played on the popular Roland MT-32, they can be adapted to run on most other synths.

Clip Tunes. Digidesign's answer to MIDI records is Clip Tunes, a CD-ROM disc containing 600 megabytes of music-library-type production music. The cuts require no licensing for unlimited use, cover a wide range of styles, and can be edited to create custom lengths. Because the music is digitized, unlike with MIDI records, you don't need a synthesizer to use them.

Direct-to-Disk Recording

Sound Tools and Audiomedia. Digidesign's Sound Tools, a NuBus board and software, turns a Mac into a self-contained recording studio, complete with digital versions of tape decks, equalizers, mixers, and SMPTE capabilities for combining music with video in multimedia applications. A second Digidesign board, Audiomedia, lacks the SMPTE capabilities.

These systems let you record any sound, whether from a microphone or as line input from a CD, tape, or synthesizer; store it on the Mac's hard disk; and manipulate it to your heart's content. These features parallel those of MacRecorder but produce a substantially higher level of sound quality.

The programs need only 50K of RAM to run properly, leaving room for MacroMind animations or other memory-intensive graphics you may want to synchronize with sound.

On the other hand, a typical sound file takes 10 megabytes of disk space per minute of sound. This is because of its CD-quality sampling rate of 44.1 kilohertz, brought into two stereo channels of 16-bit sound. In contrast, MacRecorder's 22-kilohertz 8-bit sound gives you AM-radio quality.

Multimedia Interfacing

HyperCard, SuperCard, and MacroMind Director can all play back snd resources, such as those created with MacRecorder. For higher-quality sound re-creation, two methods are available.

You can play back Audiomedia files from within HyperCard, SuperCard, or MacroMind Director, using Sound Access, an XCMD/XFCN provided with Audiomedia.

MIDI playback from within HyperCard, SuperCard, or MacroMind Director is possible with MIDIplay from Opcode or HyperMusic from Passport.

Figure 6: Music You Can Edit



Figure 6: MIDI records are synthesizer sequences supplied on Mac 800K disks that you can load into a sequencer program and play through your synthesizer. A wide range of music is available, and each disk contains two or more pieces of a particular genre.

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Deck. Digidesign's Deck turns the Mac into a digital recorder with editing and automated-mixing capabilities (see Figure 7). It works with Digidesign's Audiomedia board, providing four channels of digital audio at 10 megabytes per minute or two channels at 5 megabytes per minute. Most people don't notice when the audio is optionally compressed by 2:1.

Deck can play back MIDI files created in other programs. It can thus drive one or more synthesizers while simultaneously recording their signals digitally on the Mac. The product also provides overdubbing along with full-fidelity noiseless track bouncing. Combined with an eight-voice multitimbral sound module, it lets you create a full 32-, 55-, or 789-voice orchestral recording.

MacProteus. MacProteus is a Digidesign NuBus-card version of E-mu Systems' Proteus, one of the hottest sample-player/synthesizers available on the market today. It includes 32-voice polyphony and 16-channel multitimbral capability.

With MacProteus, Deck, and Audiomedia or Sound Tools, you can become your own effects house, commercial agency, postproduction facility, or recording studio and still have enough computing power left over to take care of day-to-day Mac chores.

Those with sufficient musical training can use such a system to create digital two-track masters, jingles, special audio effects, vocal sessions, remixes, and any number of heretofore complex sound jobs, all much faster and more easily than with traditional technology and methods.

Scoring and Synchronization

In the area of audio/video and film postproduction, several programs facilitate the process of synchronizing music and sound effects to pictures. Opcode's CUE and Passport Designs' Clicktracks (see Figure 8) let synth players synchronize sequences with film and television.

Digidesign offers Q-Sheet A/V, the new studio standard in audio postproduction. The program combines MIDI power with the bread and butter of the editing industry: the cue list (edit-decision list) and the event-based editor. The program lets users work in industry-standard time code by converting musical bars and beats automatically.

If you work on projects — be they for film, TV, or stage — for which running times are constantly changing and scenes are appearing and disappearing at regular intervals, this kind of program could change your life. It can also access the new MIDI time-code standard, which provides a bridge between SMPTE and MIDI. Most high-end MIDI interfaces already include this capability.

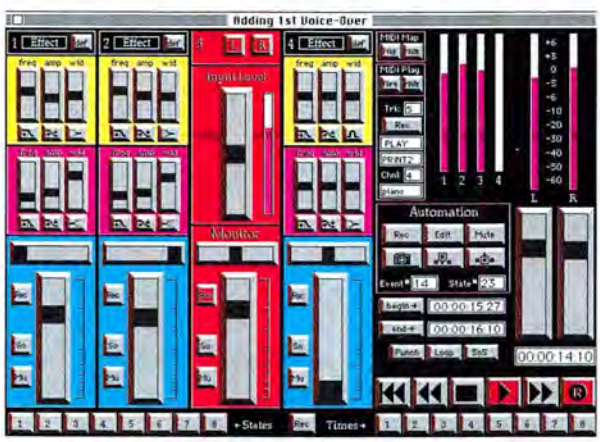


Figure 7: Digidesign's Deck software turns the Mac into a four-channel digital recorder with full CD-quality sound when you use it with the company's Audiomedia or Sound Tools NuBus cards.

Digital Audio Storage

Digital audio places great demands on disk space. When you use Sound Tools, for instance, a 60-minute recording fills a 600-megabyte hard disk and requires high-density tape backup for archiving.

Such needs have popularized removable hard-disk cartridges among musicians. Street prices have dropped to less than $700 for the drives and to less than $90 for the cartridges. One cartridge can store a four-minute stereo Sound Tools file or a four-channel compressed Deck file or an eight-minute stereo compressed Deck file.

For larger-capacity removable-media needs, erasable optical discs would prove attractive if access times could be improved substantially (see "Erasable Optical Drives," November '90, page 102). An erasable optical cartridge can hold about 300 megabytes per side, accommodating around 28 minutes of digitized audio.

Also, several vendors have announced a 3.5-inch optical drive with 128-megabyte capacity and 28-millisecond seek time. That's the minimum Digidesign's systems require for recording (playback can be accomplished from slower drives). If this optical drive works as promised, it will make an excellent choice for digital-audio applications.

DAT, Macs, and CDs

Another promising medium is CD-ROM, when DAT is used for mastering.

DAT recorders work with the Digidesign Sound Tools board and software. With this system, you can use DAT to first store the raw data and then dub the finished mix in direct digital format for mastering purposes.

Digidesign's Master List lets Sound Tools users create CD masters on DAT. (The product includes an offer from a private CD manufacturer called CD Express.) So, for example, you could create an audio presentation for the yearly sales meeting — with original synthesized music, voice-over, and effects — and give everyone a copy on CD when the meeting is over.

CD-ROM discs are becoming increasingly easier to publish. More are appearing every month, and the tide can be expected to continue to rise. Average list prices for drives, which are hovering around the $800 mark at

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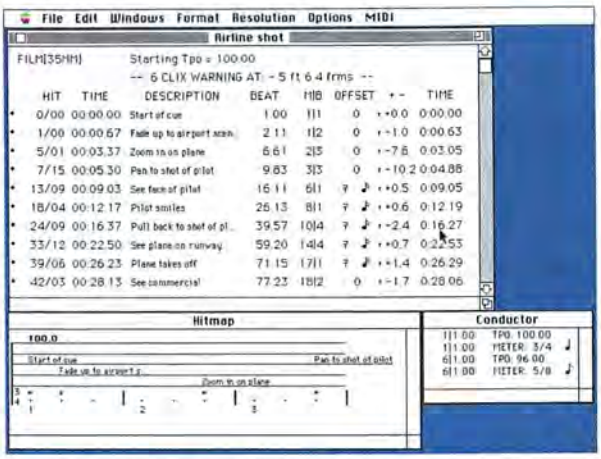


Figure 8: Passport Designs' Clicktracks lets you set precise cue points for scoring a film or video by using MIDI synthesizers.

present, are likely to continue to drop.

A variety of CD formats have evolved to store different types of information for different media. CD-Vs hold up to seven minutes of full-motion video; CD-ROM discs contain around half a gigabyte of read-only computer data; CD-ROM/XA discs (used mostly with DOS and OS/2) store compressed audio; and CD-MIDI discs contain MIDI data, of course. A CD+G disc has subcode graphics that can yield still-frame pictures, and CD-I (CD-interactive) discs carry an hour of compressed full-motion video and audio.

Applications

Despite the youth of the multimedia field, several practical sound-based applications are already available on CD-ROM disc and on laserdisc. Two notable vendors in this area are Warner New Media and The Voyager Company (see the reviews of The Magic Flute Audio Notes and The Voyager CD AudioStack, November '90, page 88).

The Magic Flute Audio Notes. Warner New Media has embarked on what it expects to be a major series of CD-ROM cultural projects; the first one is based on Mozart's "The Magic Flute." The accompanying HyperCard stack has 7,000 screens as well as interactive libretti in two languages. The company's next release, Beethoven • String Quartet No. 14, does an even better job. Unfortunately, the product's value for those trying to learn how to create interactive products themselves is limited, because the stacks are locked. Voyager's products are open, which greatly increases their value in this context.

The Voyager CD AudioStack. This product enables HyperCard users to work with a Mac-like set of software tools to precisely control CD-ROM discs. It is, in fact, the tool kit Voyager itself uses to create its own interactive applications.

Voyager has been developing industry-standard HyperCard driver and stack combinations for both laserdisc and CD-ROM and has also provided some of the best tools for producing your own interactive sound-based multimedia applications.

Ludwig van Beethoven—Symphony No. 9. Voyager's first CD-ROM project in its Voyager CD Companion Series was the Beethoven's Symphony No. 9 stack. It comprises five HyperCard stacks and an off-the-shelf London CD of the symphony.

This stack provides a model of interactive design — you can use it as an example for developing truly interactive applications, as opposed to what might be called kiosk interactivity, in which you have only a few choices and just watch an application run. In contrast, the Beethoven stack lets listeners access any part of the symphony. The stack provides many enjoyable ways to learn more about the symphony, Beethoven, and related subjects. Even those with no interest in music can learn from this carefully executed project.

Igor Stravinsky—The Rite of Spring Stack. Voyager's next release in its CD Companion Series, which should be out by the time you read this, is Stravinsky's Rite of Spring stack. Voyager mastered the CD and created the HyperCard stacks as well, so now you get the complete recording and extra sound data. For example, Voyager is providing a two-piano version of the piece as well as extra computer data and even MIDI data.

With MIDI data, listeners can hear a passage from The Rite of Spring, click on a button to see a score example, dump the MIDI data to their sequencing programs, and get music printouts as well as new ways of playing the music. Other pieces of MIDI can also be in the stacks themselves.

More Than Music

Once the exclusive province of music-studio mavens, sound is now within earshot of anyone creating multimedia applications on the Macintosh. As you can see from our discussion of sampling, you can have a tin ear and crack shower stalls when you sing in them, but you can still incorporate magnificent sounds and music into your presentations.

You might ask if it's worth the trouble. After all, nearly all computer applications have been silent so far. Well, just ask yourself this: How many silent movies were made after the first sound movie was released in 1929? And if you heard a silent movie with magnificent cinematography was playing in the local theater, would you go see it?

Ken Gruberman is a free-lance music copyist and contractor for the Los Angeles studio scene as well as the editor of his user group's newsletter and a pioneer in the field of Mac music publishing. He orchestrated the Emmy-award-winning music for "Beauty and the Beast" on a Mac. Lon McQuillin is an amateur composer whose extensive MIDI studio cost only a small fraction of the national debt.

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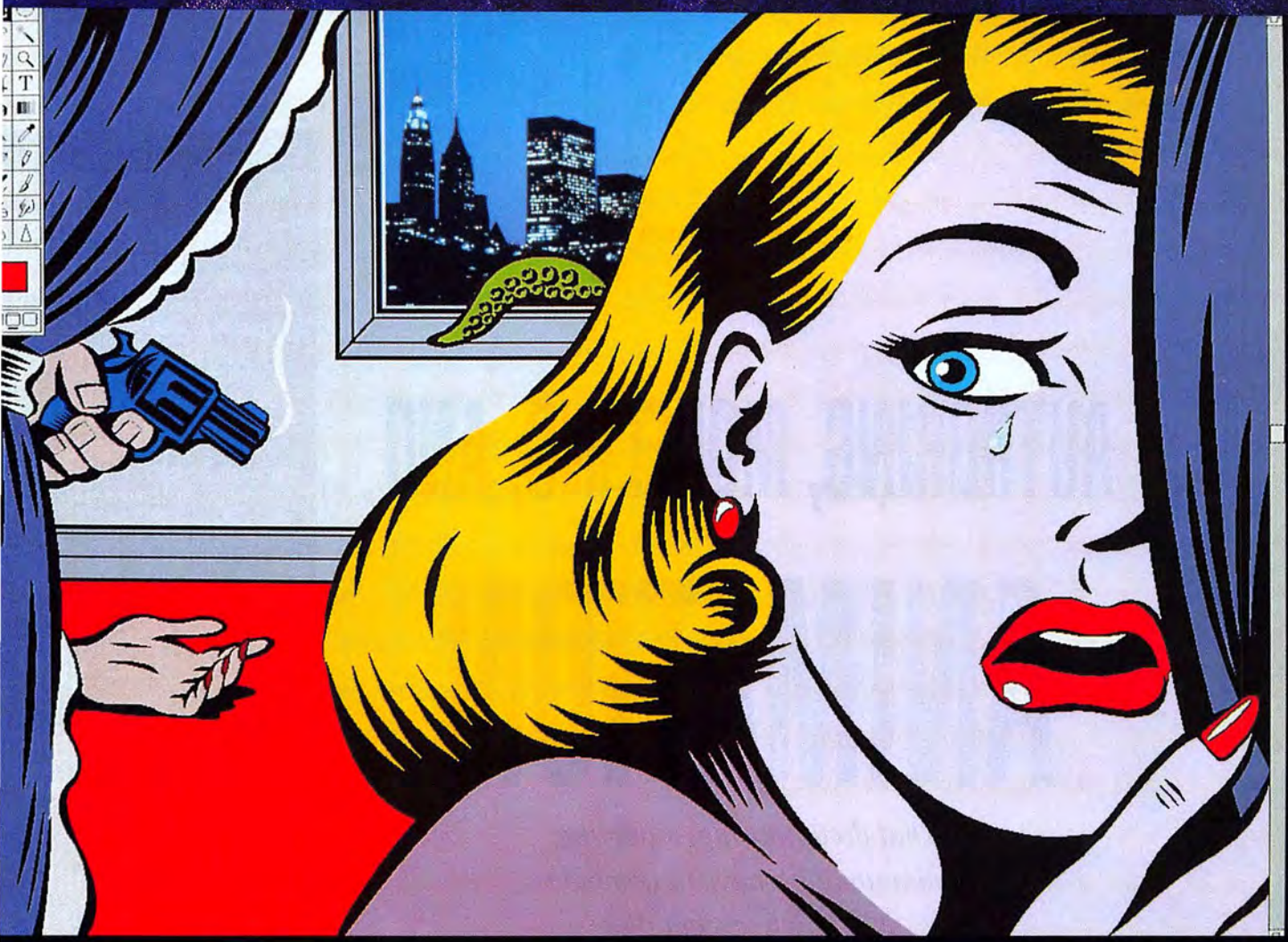
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BY LON MCQUILLIN

AUTHORING, MODELING, AND ANIMATION

What do authoring, modeling, and animation have in common? Not much, except that the pioneers of multimedia authoring systems loved modeling and animation. The rest is history.

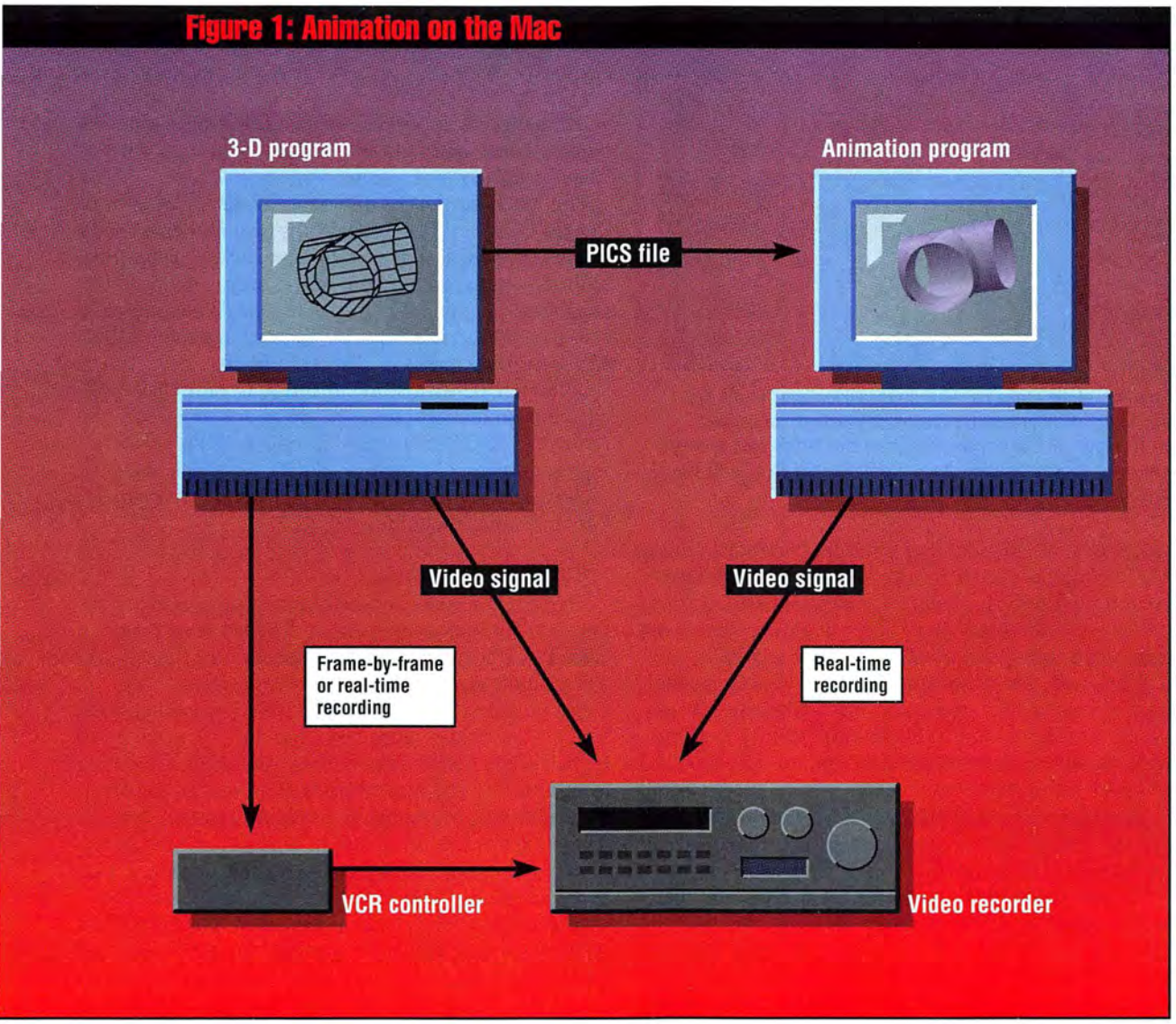
Figure 1: Animation may be recorded in either frame-by-frame or real-time mode, depending on the animation software being used and the quality of results desired. With simple images, real-time recording is possible, either directly from the 3-D program or via PICS files from an animation program such as Director. With complex images, frame-by-frame recording, using a VCR controller for single-frame animation, produces top-level results.

There are two common approaches to creating a multimedia extravaganza. One uses an authoring system as its base. An authoring system — such as HyperCard, SuperCard, Plus, or Authorware — is ideal for specifying relationships among segments or user-controlled events. The other approach uses an animation package as its starting point. Creating animation on the Mac can stretch your computer to the limit, however, and you must often use several programs together to get the desired results.

Logically speaking, animation and authoring go together about as well as oil and vinegar. But shake the bottle hard enough, and you get salad dressing. And historically, that's what has happened in the field of multimedia applications — mainly because products such as MacroMind Director have evolved from animation-creation packages to become the control centers of true multimedia presentations that combine audio, video, and interactive functionality.

Simultaneously, application-development or authoring systems such as HyperCard have

Figure 1: Animation on the Mac



gradually added the ability to import animation sequences. For example, HyperCard 2.0 can call up and run Director routines. Although HyperCard is an authoring package, a lot of animation is now done in what are nominally HyperCard applications, thanks to its XCMD facilities and add-in capabilities.

In short, the line between authoring and animation software started out blurry and has become more so.

Modeling software has tagged along with all this because it makes animation look so real, even though the massive computation requirements of modeling conflict with the speed requirements of interactivity, another important element of multimedia.

Consequently, today's desktop-media producer faces a multimedia ménage à trois — authoring, animation, and modeling — of intertwined applications. The result is a crop of applications that produce a compelling sensation of reality — the overall result all multimedia applications strive to achieve.

This sense of reality has long been a feature of



Figure 2: A frame from the 1909 animated cartoon "Gertie the Dinosaur," in all probability the first interactive multimedia presentation. At some screenings, animator Winsor McCay would appear live onstage during the film and the animated Gertie would appear to snatch off his hat.

successful presentations. Back in 1909, cartoonist Winsor McCay toured America with a simulated interactive presentation. McCay would stand onstage beside a movie screen and talk about Gertie, the Dinosaur, who would then appear on-screen beside him (see Figure 2).

What made the presentation come alive were its multiple elements: the animation, the well-drawn dimensionality of Gertie, and the illusion that McCay and Gertie were interacting — at one point, for example, she appeared to snatch off his hat and eat it.

The same elements work even better today. With your Mac and multimedia tools, you can now build in real interaction. And you don't have to draw every frame.

But you still have to assemble everything, and that's where authoring software comes in.

Authoring Versus Animation

Authoring software is to multimedia products what directors are to movies. It lets you combine and orchestrate the different media elements you're using into a coherent, sequenced whole.

Authoring software comes with a wide range of prices and capabilities. The most widespread is HyperCard, and the best known of the high-end products is MacroMind Director, but these are far from the only choices. Some authoring packages are also animation packages, and vice versa. We'll delve into animation first.

Persistence of Vision

Animation is a succession of still images that the human mind interprets as motion because of what is called persistence of vision.

This phenomenon breaks down if the succession of images is slower than 16 to 18 fps (frames per second), because we then start to perceive flicker. Traditional motion-picture and television films stay well above this threshold by running at 24 fps. Professional video normally runs even faster, at 30 fps. By contrast, a standard RGB Mac monitor repaints its display at 66 fps.

Although the Mac's fps capability is more than sufficient for animation purposes, there are some capacity problems: A full-color, 24-bit, 640-x-480-pixel image represents nearly 1 megabyte of data. No Mac is designed to shove so much data swiftly enough through its memory, bus, and storage facilities.

Real-Time Animation

The Mac can handle limited animation in ways that are practical for many applications. The simplest is just to slow down the frame speed to well below the flicker level and treat the presentation as a fast slide show.

But you can do some forms of real-time animation as well — especially when your background is going to remain pretty much the same from one frame to the next (see Figure 3). If you treat the background as one layer, often with a large amount of visual information, you can animate the active foreground elements only and superimpose them on the background, as a separate layer. This approach greatly conserves your computer resources.

These foreground elements are called *sprites* and exist independently of the background. Although the size and number of sprites you can display are limited, you can produce this kind of real-time animation successfully on the Mac — for example, you can use sprites to animate charts and diagrams in a business presentation.

Special Effects

The current crop of software lets you supplant standard slide and overhead-projection shows with livelier fare. You can use special effects, such as wipes and dissolves,



IMAGE: DOLPHIN DESIGN, FELTON, CA

to display textual information and animate charts to convey information more clearly. Animation is also ideal for showing processes that are impossible to photograph or film — the operation of a gas engine's combustion chamber, for example.

Mac Display Versus Videotape

The two most common output formats for Mac-based multimedia displays are the Mac itself and VHS-cassette videotape. Direct animated display on the Mac is constrained by limits of image quality and movement but offers the potential for interactive control.

Output to tape, on the other hand, can provide highly sophisticated image complexity and quality, because each frame is created and recorded individually. You pay for this in the time required to create complete sequences and in the probable loss of interactivity.

With videotape, interactivity is difficult because tape is a sequential-access medium. Designing applications around the need to wait up to two minutes to reach the needed tape segment is troublesome. Also, the VCR must have a serial port, so your computer can control it, and single-frame accuracy, so your computer can find the segments it needs.

Some inexpensive consumer video recorders have limited stop-motion-recording features, which may suffice for some applications.

One last factor: NuBus boards and boxes with NTSC (National Television Standards Committee) video output vary in the quality of image they deliver. The cheapest ones may produce flicker and other problems.

In simple terms, the more animation, the less interactivity, and vice versa. Before you decide which multimedia authoring and animation tools to use, you have to make some decisions about your output format.

If you start with an animation package, you'll want to consider whether the results can be exported into an authoring environment. If you start with an authoring package, you'll need to evaluate its animation capabilities and/or its ability to call animation sequences from other programs. The logical start is HyperCard, the ubiquitous multimedia software.

HyperCard. HyperCard 2.0's design, wherein cards can share common backgrounds, lets you create interactive animated presentations of sometimes surprising complexity, considering HyperCard's past limitations. The release of version 2.0 has opened up HyperCard's scope, and the extensibility of its design lets you add in new capabilities provided by third-party vendors, such as ADDmotion from Motion Works.

HyperCard 2.0 adds many long-awaited features, including variable card sizes; support for 32-bit QuickDraw color (through a new built-in XCMD); multiple windows; styled text; and hypertext, which lets users click on an individual word to get further information.

The underlying HyperTalk programming language and script editor have both been enhanced. HyperCard 2.0 also compiles scripts upon first execution of a handler, making most stacks run faster. The compiled version, however, is not saved on-disk for later runs.

The main limitation of HyperCard for animation is that it replaces entire screens, which slows it down and takes up a lot of memory. But you can use HyperCard's XCMD capability to run animations developed in other products such as MacroMind Director.

ADDmotion. This Motion Works product installs seamlessly into HyperCard 2.0 and adds the ability to do sprite-based animation. ADDmotion adds Film and Paint to the Edit menu and New Film to the Objects menu. The Paint command opens a 32-bit-color Paint window that's accessible from within HyperCard.

You can save paths for animated objects in libraries, and you can save "cast members" — animated figures created in the Paint window or imported from other programs — in libraries as well. ADDmotion lets you play up to four sound resources simultaneously and record directly from Farallon's MacRecorder.

Animations saved in stacks include all the resources necessary to play them through HyperCard 2.0, even when ADDmotion isn't present. This means you can distribute applications to other Mac users who don't have the program.

The user interface is based on visual feedback on the screen and lets you create animations without having to resort to HyperTalk.

Studio/1. At the low-price end is Studio/1 from Electronic Arts, which works in black-and-white only. You can use Studio/1 to create and play back animation or to create sequences you can view from within HyperCard. Its tools are innovative and easy to use.



Figure 3: A standard bar chart gets some visual punch with the addition of animation. MacroMind Director makes it easy to have the bars grow onto the screen and to have the bar on the far right change into a rocket that blasts off and shoots off the top of the screen.

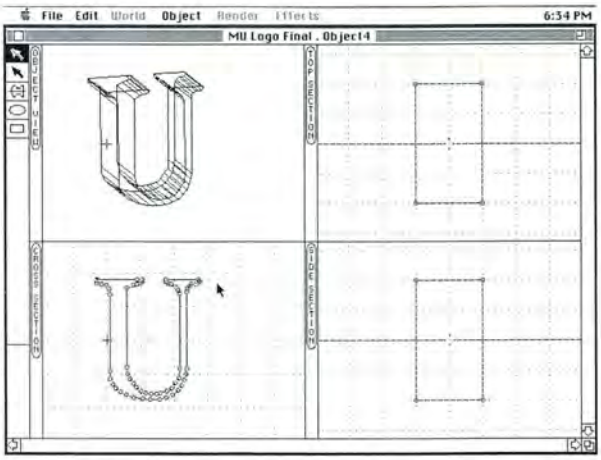


Figure 4: Objects in Swivel 3D Professional's design window are made up of a series of linked lines that describe a polygon. To create the *U* in the *MacUser* logo, the logo was first scanned as a PICT file, which was then pasted into the background of Swivel 3D Professional's object-cross-section window. The letters were then traced over the logo with the polygon tool.

Studio/1 offers two animation techniques. In the first, you create an animated brush that you can drag across the screen. For instance, if you create eight frames of a swimmer, each frame using successive arm positions, and then drag the brush across the screen, your swimmer will swim as you drag the brush along.

The second animation technique does *tweening:* You define the object you want to move and describe its path — including pseudo-3-D moves created by sizing objects — and Studio/1 does the animation work for you.

Animations created in Studio/1 can be exported to HyperCard or to Electronic Arts' own Gallery program, which can play back animations either automatically or under user control.

SuperCard. SuperCard, from Silicon Beach Software, works like an enhanced version of the earlier versions of HyperCard. It has painting and drawing capabilities, color, variable screen sizes, multiple screens, and more. SuperCard can import graphics in several formats, including HyperCard, MacPaint, PICT, and TIFF; can compile animations for increased speed; and can export PICS-format files. The program includes an unlimited run-time license.

Plus 2.0. Spinnaker's Plus 2.0 also works like an enhanced version of HyperCard 1.x. Plus' unique feature is that it works across multiple platforms. Stacks created on the Mac can be opened on PCs, in either the Windows 3.0 or OS/2 Presentation Manager environment. A run-time license costs extra, however.

Like SuperCard, Plus supports color and resizable windows and can open existing HyperCard 1.x stacks. A version that can accommodate HyperCard 2.0 stacks is in development.

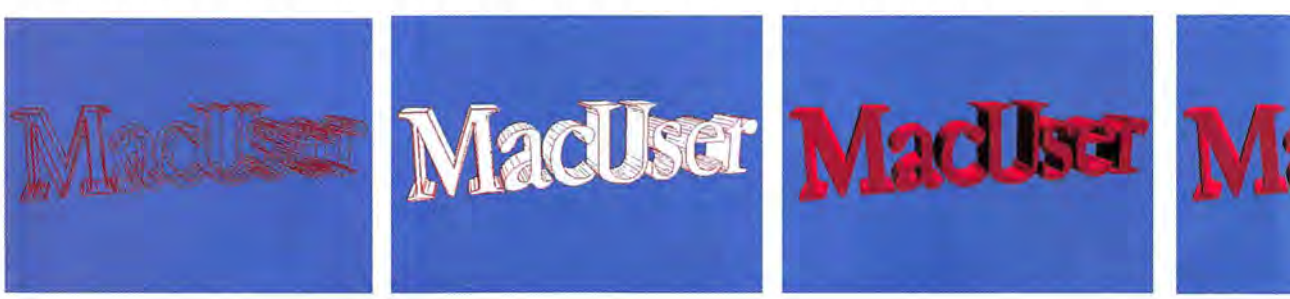
Authorware. At the highest end of authoring software is Authorware, from Authorware, the only completely object-oriented multimedia authoring tool for the Mac. Its animation capabilities include the frame-based animation common to most animation packages, plus data-driven animation, in which simple objects can be described quantitatively. These can then be set to behave in different ways, depending on user input, as with the chess pieces in a chess program. Its visual-mapping approach eliminates conventional scripting and enables nonprogrammers to create and deliver interactive multimedia applications by arranging objects along a flow line rather than by using conventional scripting.

The objects represent program events, such as interactions, decisions, and calculations, and multimedia objects, such as displays, sounds, animation, and video. All logic branching is shown graphically, and the result is directly editable. Authorware provides more than 100 built-in system functions and variables, as well as models for both logic and content. Farallon's MacRecorder is included in the Authorware package.

MediaTracks. Farallon's new product MediaTracks promises to be a boon for the concept of individualized training for Mac-related tasks. MediaTracks lets users record screen activity and then later add sound overlays, using MacRecorder, and more PICT or color PICT2 graphics.

For example, you might use MediaTracks to quickly and easily create and polish a training file on how to use Font/DA Mover or how to wade through a complex spreadsheet-based report. The resulting file would be much smaller than a similar MacroMind Director file.

MacroMind MediaMaker. MacroMind MediaMaker is an authoring program that lets you assemble full multimedia productions from a variety of sources — including videotape, videodisc, and CD — as well as Mac sounds, graphics, and animations.



The program is designed for use by people who aren't multimedia specialists. You can do complete productions without recourse to extensive scripting and can use the on-screen collection of tools without referring to the documentation.

MediaMaker has two main parts: Collections and Sequences. The Collections section lets you build databases of elements of any of the listed types. Each element is represented by a "picon" (picture icon).

In the Sequences section, you lay out your picons in the order in which you want them to appear. After you've juggled them around, you can select the Print to Tape feature to record your presentation on videotape, using a display board that provides NTSC video output.

MacroMind Director. Director can create, record, store, and play back complex animation sequences. It can also synchronize playback of sound files, such as those created with MacRecorder, and trigger MIDI devices. A companion product, MacroMind Accelerator, speeds up playback of complex scenes and large animated elements.

The Player utility included with Director compiles animated productions into "projectors" that can be viewed without Director.

Director provides a Paint window you can use to create new sprites, or cast members, and to import a wide range of graphics and sound files. Because it can import PICS files, Director lets you play back animated sequences created in several 3-D-modeling programs. A common use of Director is simply to play back files created in other programs.

Director-based animations are generally of the sprite-over-background type, but more-sophisticated projects are possible. For example, you can create a "movie" of digitized video comprising, say, twenty-seven 8-bit-color 320-x-240-pixel frames. With the images superimposed over a drawing of a movie screen created in Director's Paint window, and playing the movie as a repeating loop, you can achieve a display rate of roughly 22 fps on a Mac IIci. Viewers see this as very fluid motion, although 8-bit color imparts a posterized quality.

A product called MacroMind Windows Player allows you to play Mac-based Director sequences on a PC under Windows.

FilmMaker. Paracomp distributes this French program, which is quite a bit easier to use than Director but which boasts a wide range of abilities nonetheless. It consists of four modules (Animate, Color, Sound, and Present) and five utilities (FilmMaker DA, Mark, Picture Runtime, Sequence Runtime, and Sequence Transfer). FilmMaker provides the ability to render colors in 8-bit palettes, with anti-aliasing, dithering, and remapping options. The Animate module offers tools for performing a wide range of animation effects on graphic objects, such as having the colors change while an object rotates. The Sequence Transfer utility lets you play back animated sequences in HyperCard. The Color module imports PICT, PICS, or EPS files and provides for color manipulations. The Sound module imports sound resources created in other Mac applications. The Present module assembles presentations from sequences and images, offering a wide range of transitions.

Animation Stand. A new $2,000 system, Linker Systems' Animation Stand, can be used for creating real-time animation or working in frame-by-frame mode. It uses the metaphor of the traditional animation device from which it takes its name. It has five modules. The first two comprise a sophisticated painting program that falls between a traditional 2-D program and a 3-D-modeling program and a programming language that falls between HyperTalk and BASIC. The language compiles animation sequences and commands for maximum speed.

The other modules are exposure-sheet and optical-press simulators, along with a transport-controller interface that can work with frame-by-frame controllers.

interFace. This unusual program from Bright Star Technology lets you create "actors," which are animated talking heads. Using up to 120 facial-image positions, you can synchronize the actors' faces either to digitized speech or to text that is "spoken" by MacinTalk. You can draw or import any kind of image — not just faces — but you're limited to 120 animation frames.

interFace primarily allows you to create animations for use in HyperCard, SuperCard, or any other application that supports XCMDs. BrightStar demonstrates the product with a training program on how to use Excel and a Japanese-language teaching program.

MouseRecorder. This unique system, currently under development by Whitney Educational Services, will let you record and narrate live on-screen presentations. It works by eavesdropping on mouse and keyboard signals before they get to the Mac. The signals are recorded on a standard stereo audiocassette tape. One channel of the



Figure 5: The *MacUser* logo in six views as created in Swivel 3D Professional: wire frame, with hidden lines removed, outlined, shaded, smoothed, and fully shaded and smoothed with shadows and anti-aliasing

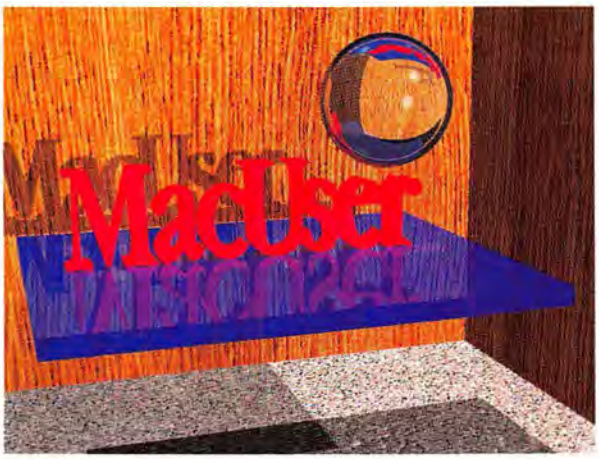


Figure 6: The *MacUser* logo was scanned into a Mac and turned into a PICT file. The PICT file was then ray-traced and extruded in StrataVision 3d, which was also used to create the crystal ball. The wood paneling was loaded from the attributes file of Studio/8. Using version 1.4.2 of StrataVision 3d on a Mac IIci, the rendering time for this image was approximately 12 hours. Version 2.0, due out by the time you read this, promises to render roughly three times faster.

tape records the ADB (Apple Desktop Bus) signals going to the Mac, and the second channel is available for voice narration. When you play the tape back through MouseRecorder, the Mac sees the mouse and keyboard signals and duplicates whatever you did during the original recording — rather like a player piano for the Mac.

Professional-Quality Output

When it comes to real-time animation, the level of quality required is defined by the purpose for which the Mac is being used. For example, an animation of a piston's movements inside an engine can look pretty good, but nobody would mistake it for traditional cel animation. Producers who create real-time animation on the Mac typically describe their results as being of "high-end industrial" quality, to which they invariably add "but at a much lower cost and development time than with traditional methods."

There are high-level applications in which the Mac's limited real-time-animation capabilities work well; for example, the standard TV-news weather report that uses a local map with animated temperatures appearing at various locations. This can be done on the Mac and output as an NTSC video signal, with no apologies needed for image quality.

Interactive Presentations

Interactive presentations are an ideal use for real-time animation on the Mac: Applications can allow users to control a presentation, creating a path through and around its various segments.

Architects, for instance, might use a program such as DynaWare USA's DynaPerspective to create a 3-D model of a building and then create a series of views from within it, allowing clients to move from room to room at will. Each view can include animation within a scene. A view out of an office window, for example, might include cars moving on the streets. Virtus' forthcoming Virtus WalkThrough can also be used for similar walk-through (or fly-through) explorations of a so-called virtual reality.

Interactive-animation tools include HyperCard, which can perform simple card-flipping-type animation; SuperCard, which is able to play PICS files created by 3-D drawing programs and move graphic elements around on the screen; and at the high end, MacroMind Director, which offers a scripting language called Lingo that resembles HyperTalk and gives users control of presentations.

Frame Tearing

Designers should keep several factors in mind, including the quality of movement that can be achieved when doing animation on the Mac.

Although you can animate a few sprites fluidly, large numbers of them or larger objects exhibit frame tearing, because the Mac can't redraw an element in its new



Figure 7: Infini-D creates realistic images through surface normal perturbation and constructive solid geometry.

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position fast enough for it to be finished before the next frame needs to be displayed.

Frame tearing results in an effect similar to seeing a truck through heat waves on a highway, except that the waviness is sharp-edged.

You might think that putting the speed of the IIfx to work would dramatically enhance the abilities to produce real-time animation, but the difference is only incremental. NuBus is the culprit; it simply can't transfer enough data fast enough to smoothly animate large elements.

Video Anomalies

If a presentation will be videotaped for distribution, you need to be aware of the characteristics of the NTSC video signal: Avoid horizontal lines that are an odd number of pixels wide. Avoid abrupt transitions between primary colors, especially bright reds. And for the best results, use software that performs anti-aliasing (blending of colors to smooth transitions) for both graphics and text.

Unfortunately, although anti-aliasing creates much-better-looking NTSC images, it also often results in perceptible blurring when the same image is viewed directly on the Mac's display. Thus images and animation for video distribution must be designed differently from those that are for direct presentation on the Mac.

Another factor to deal with is color saturation. Fully saturated colors tend to smear on an NTSC monitor. This problem is addressed by one 2-D paint package due out at about the time you read this: Time Arts' Oasis. Among the palettes available in Oasis is one called Video-Legal Colors that limits saturation to 75 percent. It also provides Safe Action and Safe Title, which superimpose overlay grids within which action and titles should be confined to avoid falloff around the edges.

Oasis also supports superimposing two documents simultaneously with selective transparency and also lets you superimpose graphics over full-motion video. This last feature requires a 32-bit-video output board such as the TrueVision NuVista+.

The software and hardware currently available for the Mac let you create high-quality animation with final output to videotape.

3-D Modeling

The new frontiers of computer animation are reached through 3-D-modeling and -rendering software such as Silicon Beach's Super3D, Paracomp's Swivel 3D Professional, DynaWare USA's DynaPerspective, Strata's StrataVision 3d, and MacroMind Three-D.

In developing animation, you first create individual elements in a drawing environment. You keep each element in memory as a mathematical description that the software then draws on the screen, so you can move it, rotate it, and link it with other objects (see Figure 4).

Because 3-D programs keep track of the actual shapes of objects as well as any physical characteristics assigned by the designer, the movements that can then be assigned can be highly realistic. The metal band of a wristwatch, for instance, can be designed to bend inward but not outward.

Once elements have been described — either by entering them with drawing tools, by tracing over bit-mapped images, or by reading in a text file containing a list of coordinates and attributes — the program can display them in a variety of forms. These range from simple wire-frame representations to fully modeled and smoothed shapes, with numerous controllable light sources (see Figure 5).

The process of transforming an object from a mathematical description into a realistic-looking image is called rendering and can be approached in different ways. Several techniques, including mapping, shading, and ray tracing, are often used in combination.

Mapping. Mapping involves taking a two-dimensional graphics file that describes a surface texture — for instance, wood grain, marble, or chrome — and projecting it onto an object's surfaces. At more-sophisticated levels, often called bump mapping, mapping includes not only an image but a texture as well. Libraries of texture maps



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are available from many of the companies that produce modeling and rendering software.

Shading. Shading, which you can perform in several ways, gives objects dimension by controlling the way one or more light sources illuminate objects. More-sophisticated shading techniques provide smooth transitions on curved objects and let objects cast shadows.

Ray Tracing. Ray tracing is a computation-intensive technique that plots a view of every pixel in a scene through a virtual camera's lens. It takes into account the location, strength, and quality (pinpoint or diffuse) of all light sources, along with the surface characteristics of each object in the scene. Shiny objects reflect other objects, and realistic shadows are cast. Ray-tracing one complex image can take hours on a Macintosh (see Figure 6).

Tweening. When it comes time to create motion, some 3-D programs can perform tweening (slang taken from the animator's term *in-betweening*), in which you specify a starting position for an object (and/or the camera), an ending position, a path to follow, and the number of frames over which to distribute the motion. Start the tweening process, and the program automatically creates the movement for you.

Modeling and Rendering Software

Super 3D. Super 3D 2.1 from Silicon Beach Software is a drawing program that gives users extremely precise control over object size and shape and over camera placement. It can control up to four light sources and can save animations as movies that you can play back at speeds approaching or at real time. In addition to using its drawing tools, you can have Super 3D read a text file called a display list and then create objects and images automatically.

Super 3D is designed primarily as a modeling program and doesn't perform high-level rendering, although its files can be imported into several rendering programs.

Swivel 3D Professional. Swivel 3D Professional from Paracomp can map a texture from an external file onto an object, control up to eight light sources, do several levels of shading, and perform anti-aliasing of objects to eliminate the jaggies. It offers powerful tweening capabilities, including accelerating and decelerating moving objects for fluid, natural motion.

Swivel 3D's real-time-animation capabilities are limited to primitive wire-frame representations that let you see how movement will appear, but the program can export PICT, PICS, or Scrapbook files that can be played at full motion in MacroMind Director or, for PICS files only, in MacroMind Accelerator. It can also trigger animation controllers, such as those from Diaquest, for automatic recording of rendered animation sequences.

Part of Swivel 3D's appeal is its intuitive interface; experienced Mac users should be able to start creating substantial 3-D images after an hour's training and another hour's fiddling.

DynaPerspective. This 3-D-modeling and -rendering program really excels in animating architectural models. You can import PICS animations from Director, but the native High Speed Film format is much faster. Files can also be exported to StrataVision 3d and Pixar's MacRenderMan for high-end rendering.

StrataVision 3d. This high-end offering from Strata is notable for both its reasonable price and the fact that it combines modeling and high-quality rendering in a single program. As with DynaPerspective, this saves you from having to switch among modules or programs to perform a complete modeling and rendering session.

Like DynaPerspective, StrataVision 3d provides familiar drawing tools for constructing objects, along with the expected extrude and lathe functions. It can also autotrace imported PICT images and smooth text, if you have Adobe's ATM installed. It offers a wide range of control over rendering options, and when the appropriate ones — such as reflectivity and refraction — are enabled, StrataVision 3d does ray tracing. It's the lowest-priced program that does this. Complex images with clear or reflective objects can take a long time to render, however.

Unlike Swivel 3D, StrataVision 3d doesn't perform



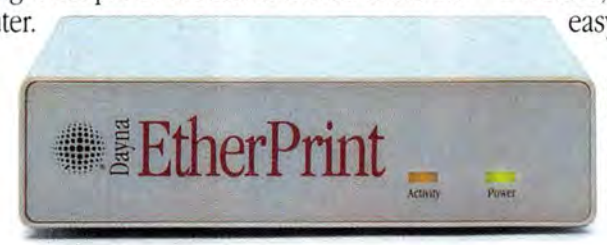
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object animation. Strata does, however, offer a companion program, StrataFlight, that can animate the virtual camera's position to create walk-throughs and fly-bys.

Another companion program, StrataVision 3d SRX, adds RenderMan file-output capability to StrataVision (see "MacRenderMan," later in this article).

Infini-D. This new Specular International program, due by the time you read this, promises unique modeling capabilities at a very competitive price (see Figure 7).

It can produce such effects as a truly bumpy surface with appropriate shadows or spreading ripples (called surface normal perturbation) or let you slice into solid objects with various types of "cookie cutters" (called constructive solid geometry). It also supports self-shadowing objects.

Also unique are its mapping capabilities. Specular provides a library of 3-D texture maps. If you map a wood grain onto an object and then cut that object in half, the end cut will have a realistic cross-section of the wood that matches the cut point. The net result is almost eerie in its realism.

Infini-D offers animation functions, including interpolation, not only between object positions but also between colors, surface maps, and even wire-frame shapes. A red ball, for instance, can transmogrify smoothly into a blue cube. The program performs various levels of rendering, including fast ray tracing, and it can also output PICS files for viewing in programs such as MacroMind Director.

Ray Dream Designer. A new company named Ray Dream has previewed this powerful 3-D-modeling and -rendering program. Ray Dream Designer offers a wide range of modeling tools and capabilities that are particularly intuitive and easy to use. When you're linking objects, for instance, it presents a Finder-like hierarchical display that makes relationships very clear.

Ray Dream Designer provides a variety of shading functions, including very fast ray tracing. It also performs two-pass anti-aliasing of PICT files, including those created in other applications. The program should be available by the time you read this.

Presenter Professional. Visual Information Development, Inc. (VIDI) offers a series of modeling, rendering, and animation programs. A new bundle plus update, Presenter Professional, combines and supplants the earlier 3-D modeler, presenter, and ray-tracer products. Presenter Professional offers improved ease of use.

The Presenter module performs rendering and animation functions. It has a spreadsheetlike design that permits time-line-based control of individual elements within a scene, and it can import 2-D files created in MacDraw, FreeHand, Illustrator, or other 2-D programs and render and animate them in 3-D. The RayTracer module performs the higher-quality rendering that its name implies. VIDI also offers a collection of surface textures such as marble, wood, and grass in a package called Dimensions Materials.

MacroMind Three-D. Also structured as a series of modules, MacroMind Three-D includes 3DWorks, RenderWorks, and ImageWorks. 3DWorks imports 3-D models created in a variety of CAD and modeling programs and is used to move the objects, camera, and lights to create animated sequences. The Render command then launches RenderWorks, which renders the wire-frame models and in turn launches ImageWorks. ImageWorks can perform anti-aliased compositing of objects and is the module in which the final animation is put together. ImageWorks can create a PICS file for use in MacroMind Director or Accelerator or as a series of PICT images. It can also control video recorders, using Diaquest, Lyon-Lamb, or Videomedia controllers.

Sculpt 3D. Sculpt 3D, from Byte by Byte, is a high-end vector-based object-modeling and -rendering program. It sports extensive editing abilities, allowing objects to be modified at the vertex level. This gives you more freedom than you have when you work with the primitive objects used with most modeling programs. Sculpt 3D is able to perform numerous levels of rendering, including ray tracing.

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IMAGE DUANE MAXWELL AND GABRIEL WILENSKY

Figure 8: Pixar's MacRenderMan accepts input files from a wide variety of 3-D graphics programs and performs photo-realistic rendering. Note the motion-blur effects on the ball and flipper.

Animation System, from Electric Image, can't create 3-D models, but it can import files from virtually any modeling program and perform extremely high-quality and high-speed rendering.

The ElectricImage Animation System can control a wide range of video-recording devices and can work with multiple networked Macintoshes to speed the animation process.

MacRenderMan. Pixar has proposed its RenderMan protocol as a graphics-interface standard for a variety of computers, and the protocol has been embraced by many software suppliers.

MacRenderMan accepts files from 3-D-design programs in the RenderMan Interface Bytestream (RIB) format — already widely accepted — and outputs PICT, EPS, and TIFF files. It produces photo-realistic images and offers capabilities never before available on the Mac, including motion blurring, which can greatly enhance the realism of animated sequences.

RenderMan is a rich interface that can be exploited at many levels. The extent to which various developers of 3-D software take advantage of its capabilities will determine the results achieved with different programs.

Levco's RenderMan Accelerator card is built around an Intel i860 processor running at 40 megahertz. It can speed image rendering by a factor of 30.

MacIvory. Symbolics took both the hardware and the software from its popular graphics workstation to create MacIvory, the highest-end rendering and animation system for the Mac. Using a 40-bit CPU on a NuBus card, MacIvory can create broadcast-quality images. If you want to go all out, $50,000 will buy you the card and the software along with a fully loaded Mac IIfx, a NuVista video card, and a host of peripherals.

The Ideal System

Simple animation and authoring can be done on anything from a humble Mac Plus on up. But without a more sophisticated platform, you'll quickly come up against a host of bottlenecks — including color, speed, screen real estate, and output options.

An ideal system for creating animation and doing authoring would be a Macintosh IIfx with a 600-megabyte hard-disk drive, an 8-millimeter tape or optical-disc drive for backup and archival copies, a multisync monitor, a 24-bit-color display card, a frame-grabber card, and possibly various video sources — VCRs, laserdisc players, and cameras. All this easily adds up to $20,000 or more.

If your needs can be met by the Mac's real-time-animation capabilities and the software mentioned above, you'll probably find that your productivity will increase, because the available tools make the creation of live animation and presentations much simpler and faster than traditional methods do.

If you're tackling high-end, frame-by-frame animation, however, the time factor is worth careful examination. As the quality of images increases, so does the rendering time.

As an experiment, we took a very simple example — a 3-D rendering of the *MacUser* logo created in Swivel 3D — and made it fly around the screen through 30 frames, creating a PICS file for playback in MacroMind Director.

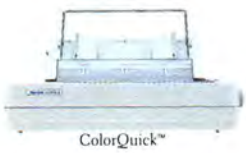
If transferred frame by frame to videotape, the entire sequence would last one second. With anti-aliasing and shadow options turned on, and running on a Mac IIci, rendering the entire sequence took a bit more than an hour.

Complex images can take dozens of hours to render on the Mac. The introduction of MacRenderMan will open the door to the creation of startlingly photo-realistic images on the Mac but may also leave users gasping at the amount of time necessary to render a single frame. A complex image such as "Pinball" (see Figure 8) can take more than 24 hours to render on a Mac II and more than 9 hours on a IIfx. And on videotape, that frame passes by in $^{1}/_{30}$ second.

The solution is to add dedicated hardware. For example, Levco's RenderMan Accelerator reduces the rendering time of "Pinball" to less than an hour. Of course, there's Symbolics' workstation-in-a-Mac for those who *really* want to get serious. The full MacIvory system fills up all six NuBus slots of the IIfx. But nobody said that state of the art was cheap.

Lon McQuillin humbly tries to personify the Renaissance man. Among his pursuits are the design of computer graphics and animations.




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Microtek Scan Original: 8 x 10 color print
Brightness level: n/a Input resolution: 150 dpi
File Size: 1,506K Output Resolution: 300 dpi
Line Screen: 158lpi Color Correction: None



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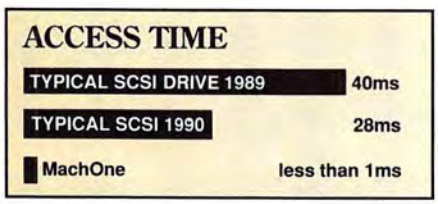
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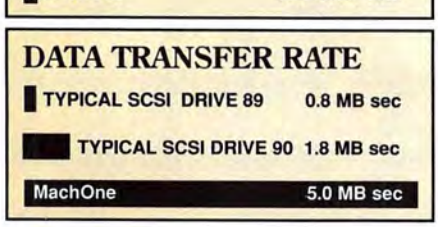


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PICTURE-PERFECT PORTRAITS: Full-Page Displays

See all you can see! It's now cheaper than ever to turn your Mac into a full-page performer.

BY KELLI WISETH AND THE MACUSER LABS STAFF

It's a buyers' market in real estate these days — whether you're dickering for that little bungalow you've had your eye on or appraising the wide-open spaces of a large-screen Mac display. Screen real estate is cheaper than ever before — you won't need to spend that spare $100,000 you've squirreled away for a down payment.

Close to a dozen full-page displays are available, with prices starting at less than $500. Whether you're buying your first Mac or want to add to your present system, a full-page monochrome display — which lets you view an entire 8.5-x-11-inch page without scrolling or zooming — might be the perfect picture window for your Mac.

Sure, you can buy monitors larger than the full-page models, or you can splurge on color or gray-scale displays. But why buy more real estate than you need? Why buy a three-bedroom, two-bath designer home for just you and your beagle? If you're doing color-illustration or prepress work, yes, you'll need a color monitor (see "In Living Color," May '90, Buyer's Guide, page 32). If you want to work on gray-scale photos in Photoshop, Digital Darkroom, or ImageStudio, you'll want the full 256 shades of gray of a quality gray-scale monitor (see "The Golden Age of Gray Scale," October '90, page 150). Or if you do publishing work that involves two-page spreads, you probably won't be happy with anything less than a two-page display (see "A Study in Black and White," April '90, page 182). But if you're like most users and your work involves



PHOTOGRAPHY: STEVE UNDERWOOD


PICTURE-PERFECT
PORTRAITS:
Full-Page Displays

word processing, spreadsheets, simple page layout, or database management or if you feel cramped by the 9-inch screen on your Mac Plus, SE, Classic, or SE/30, a full-page display can serve your purposes just fine (see Figure 1).

MacUser Labs put ten full-page-display systems through its demanding suite of monitor benchmarks. In addition to conducting objective instrument tests, we assembled a panel of video veterans to appraise focus, geometry, and nuisance factors — flicker, jitter, glare, noise, and irregularities in the screen's brightness.

We tested only complete display systems — monitors and their accompanying video cards — for two reasons. First, features are embodied in both components, so there is no way to accurately review monitors or cards independently of each other. Second, although they are sold separately in many cases, video cards and monitors for the Mac are most commonly bundled. You get the necessary cables and software, if any, plus you have the assurance that the board and monitor work together.

The monitors we tested are all 15-inch full-page displays, with the lone exception of the 21-inch DTI SpeedView, which resembles a two-page display turned on its side. Three of the 15-inch displays — the Apple Portrait Display, the Radius Pivot, and the Sigma Designs PageView — come in pricey packages that cost well over $1,000. The rest cost less than $1,000. Three — the Cutting Edge Full Page Display, the Ehman Full Page Display, and the Mirror Technologies PixelView I — are identical monitors that use the same tubes (two even come with the same manual). The remaining displays — the MacTel Index Portrait, the Mobius One Page Display, and the Princeton Publishing MultiView II — use different tubes and software.

The Radius Pivot has a unique feature — as its name implies, it can be rotated 90 degrees to either a portrait or a landscape (wider than tall) orientation. This feature makes the full-page-display solution even more versatile: no more scrolling around to look for the right half of your landscape-oriented newsletter or the last few months of your annual balance.

New Displays for New Macs

Now that the ribbons and confetti from Apple's grand unveiling of the new Macs have settled, third-party vendors are beginning to provide peripherals for these platforms. You'll find the new Macs attractive because of their low prices, but vendors are facing a harder time making peripherals such as full-page displays work with the new machines. The problems range from the Classic's slotless closed architecture to the LC's limited space for add-in cards and inability to draw more than 4 watts of power from its PDS (processor direct slot). Both the LC and the IIsi have built-in video capability, but a separate video card can improve system speed. A full-page display is an obvious solution for many owners.

Sigma Designs was one of the first vendors to announce a display for the new IIsi, only a week after Apple's announcement of the machine. The PageView GS Full-Page Display ($899) is compatible with the Mac IIsi and IIci — both Macs have on-board video that can drive a full-page display directly. The PageView GS also includes a tilt-and-swivel base and a set of software utilities; an antiglare screen ($100) is optional. At half the price of the Apple Portrait Display, the PageView GS should be an attractive first buy for IIsi users. The PageView GS is also the first Sigma Designs monitor to offer the company's proprietary Low-Emissions technology as a standard feature. Sigma Designs, 46501 Landing Parkway, Fremont, CA 94538; (415) 770-0100.

Another vendor that offers plug-and-play with the IIci and IIsi is Software and Hardware That Fits. It's listing a full-page display for an incredibly low $395. Software and Hardware That Fits, 20200 Eastway Village Drive, Suite 100, Humble, TX 77338; (800) 972-3018 or (713) 540-2300.

Apple offers adapter cards for the IIsi that add an SE/30-style PDS or a NuBus slot — along with an FPU (floating-point unit) math coprocessor. Radius has announced its own PDS adapters — the Pivot IIsi Interface ($695) and the Two Page Display IIsi Interface ($595) — for its monitors. Both will include an '030 Direct Slot Adapter, eliminating the need for the Apple PDS adapter. In addition to these cards, the Radius Color Display ($4,295), Gray Scale/Color Interface ($1,395), DirectColor Series of interfaces ($1,095 to $1,895), and PrecisionColor Calibrator ($695) are currently compatible with the new IIsi.

Nutmeg Systems began shipping its PDS Adapter Card ($149) for the Macintosh IIsi soon after Apple announced the new Macs. This card allows most cards designed for the SE/30 to work in the IIsi's PDS. Although Nutmeg's adapter is less expensive than Apple's, it does not include an FPU. Nutmeg will be offering a new line of displays for the IIsi, including a 15-inch monochrome portrait system ($1,299); a two-page monochrome system ($1,699); a 19-inch, 8-bit gray-scale system ($1,899); and a 20-inch Trinitron system ($4,988). Nutmeg's new board offerings include 8-bit boards that drive Apple's familiar 13-inch RGB monitor at nearly twice the speed that the IIsi's internal video circuitry does. Nutmeg will also offer monochrome boards for Apple's 15-inch Portrait Display ($699) and 21-inch Two-Page Display ($699) with the same speed advantage over the internal video circuit. Nutmeg Systems, 25 South Avenue, New Canaan, CT 06840; (203) 966-3226.

Lapis Technology will be introducing its own video cards — the DisplayServer Classic, DisplayServer LC, and DisplayServer IIsi — for all three new Macs. All three cards, due to ship by the time you read this, are programmable. These cards will drive an inexpensive 14-inch VGA monochrome display with a resolution of 640 x 480 pixels as well as Apple's 12-inch monochrome and Portrait Display and several third-party displays. The DisplayServer LC may also be able to drive 19-inch and 21-inch two-page displays, but Lapis is still trying to figure out a way to draw more than 4 watts from the LC. The card for the more powerful IIsi will have no problem driving a 19-inch or 21-inch two-page display. The VGA solution should open the Mac-monitor market to PC vendors, which should drive prices even lower for Mac displays. Lapis Technology, 1210 Marina Parkway, Alameda, CA 94501; (415) 748-1600.

— Darryl Chan

Pixel Packing

A monitor's screen size is given as the diagonal measurement of the CRT (cathode-ray tube) as it comes from the factory. Some of the screen is hidden by the monitor's frame and the active area is smaller still, so the active screen area on any monitor is somewhat smaller than the stated size. For example, the Sigma Designs PageView, a 15-inch monitor, has an actual display area of 13.4 inches (diagonal), or 8 x 10.7 inches. So how does an 8.5-x-11-inch page get fully displayed in an active area smaller than 8.5 x 11?

The answer lies in the monitor's *resolution*. Resolution is described in terms of *pixel dimensions* and is measured in *dpi* (dots per inch). Pixel dimensions are listed as the height and width of the screen as measured in pixels (dots); multiply the two numbers, and you get the total number of pixels on the screen at any one time.

A monitor's dpi number tells you how many pixels are packed per inch. Most word-processing and spreadsheet applications assume that an inch contains 72 pixels. At this monitor resolution — 72 dpi — an 8.5-x-11-inch page cannot appear in its entirety in the active area of a 15-inch monitor. If the monitor displays 78 pixels per inch, however, the page will fit neatly on the screen, because the *application's* 72-pixel inch is actually displayed smaller than the *monitor's* 78-pixel inch. There's a trade-off for being able to view an entire page at once, though: True WYSIWYG is important in desktop publishing, and true WYSIWYG requires 72 dpi for application *and* monitor.

Only the Sigma Designs PageView and the DTI SpeedView offer true WYSIWYG 72-dpi resolution (the PageView is capable of 72, 80, and 88 dpi). The Princeton MultiView II shows 76 dpi, the Radius Pivot and Mobius One Page Display show 78 dpi, and the other monitors have 80-dpi resolution. On screens with a resolution of more than 72 dpi, documents appear somewhat reduced. But don't let this dissuade you: Few people can differentiate among monitors with slightly different dpi ratings, and the ability to display a full 8.5-x-11-inch page is usually more important than true WYSIWYG.

Figure 1: Viewing Area

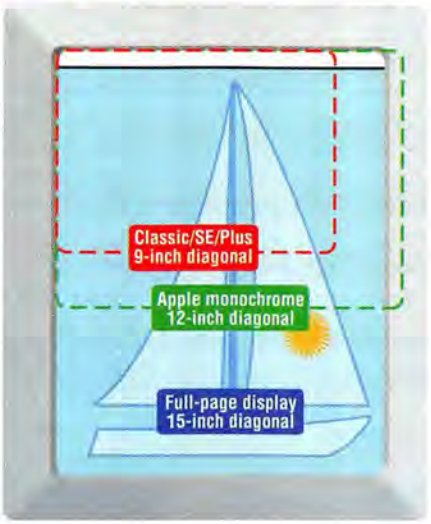


Figure 1: A 15-inch full-page display can show all of an 8.5-x-11-inch page, whereas the Classic's 9-inch monitor and the Apple 12-inch monochrome and the Apple 13-inch color monitors show only part of the page. The 21-inch DTI SpeedView can show a full tabloid page. Most Mac users do word processing, so convenience alone should make a full-page display the monitor of choice.

Board Bored?

Your choice of a full-page display is limited by the kind of Mac you have. Because the Mac II, SE/30, and SE have different internal designs, you need to pick from the monitors that have a video card that's compatible with your model. All the systems we tested have interfaces for Mac IIs, seven are available for SEs, and eight offer cards for SE/30s. If you have a Plus and want to upgrade your screen acreage, you have but one choice — the Mirror Technologies PixelView I (see Table 1). You can also get the Radius Pivot with a nonpivoting FPD Interface ($595) for a Plus in lieu of the Pivot interface. Also available is a nonpivoting interface that is compatible with the SE, SE/30, and Mac II line. If you've just bought one of Apple's new Macs — a Classic, LC, or IIsi — see the "New Displays for New Macs" sidebar for what's available.

If you're thinking of trading up from an SE to a NuBus Mac, some vendors offer an upgrade path and some don't. With the Apple and Radius monitors, you can consider upgrading their gray-scale capabilities. Both systems as shipped are low-level gray-scale monitors, with 4 gray levels, but you can upgrade both to 16 gray levels by adding video-memory chips.

The DTI SpeedView comes with either a monochrome or a gray-scale card. If you buy the monochrome version and later want to upgrade to gray-scale, DTI will let you swap and pay only the difference in price between the two — a reasonable $700.

No matter which display system you choose, the video card is easy to install into any member of the Mac II family. Just pop open the top of the Mac, slip the card into a NuBus slot, and connect the cable to the back. If you have an SE or SE/30, however, ask your dealer to install the card — you'll void your warranty if you open the case and install the card yourself. If you're daring, both Ehman and Cutting Edge provide the tools you'll need to open the Mac's case as well as excellent step-by-step instructions, with photographs, for installing a card in an SE or SE/30. If you're less adventurous, the company will refund you $25 after your dealer has installed the card.

The Mobius card for the Mac SE

provides a bonus: It's a CPU accelerator as well as a video card. The card has an on-board 16-megahertz 68000 chip with an optional FPU (floating-point unit) math coprocessor. Besides improving screen-redraw speed, the card's faster processor, whose speed is double that of the normal SE processor, can benefit every application.

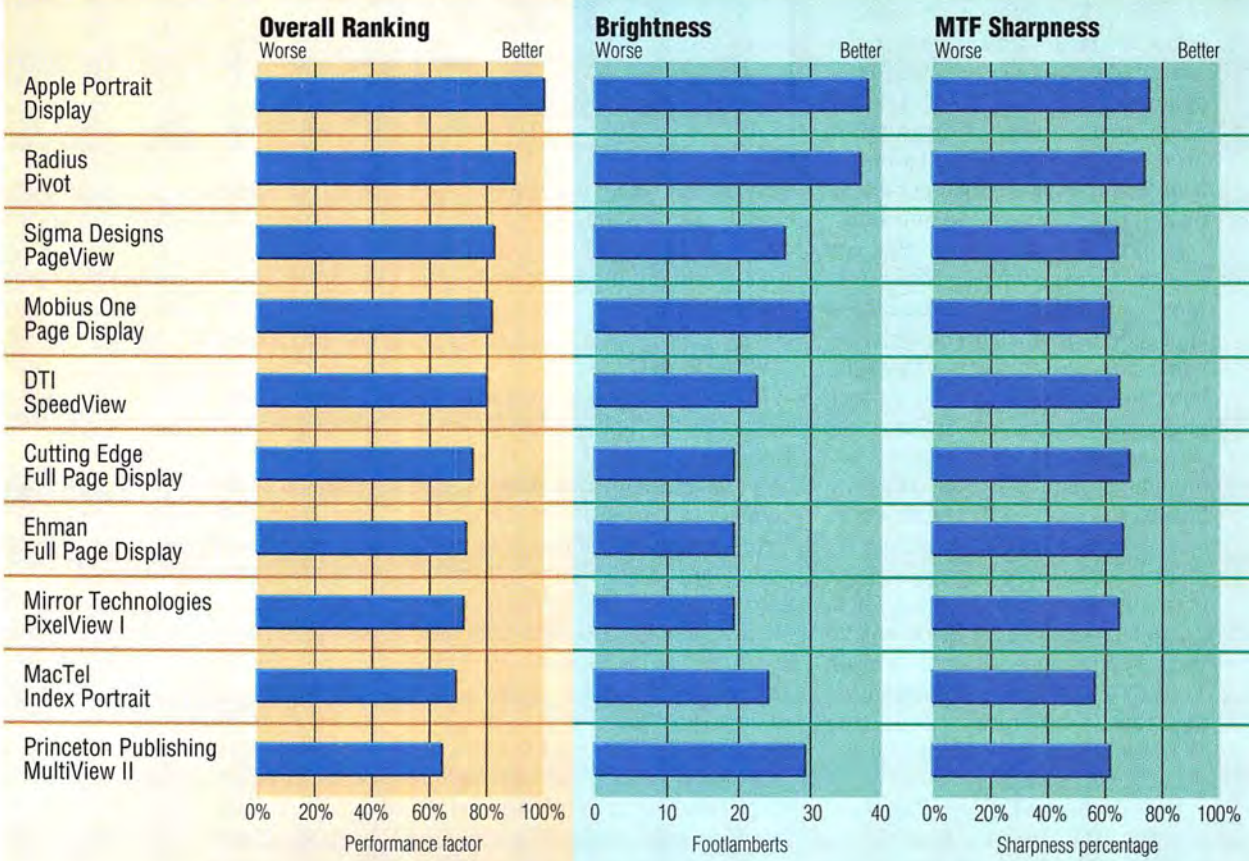
Installation is a greater chore with the Plus, which doesn't have a slot for a video card at all. Instead, you must carefully crack its case and even more carefully clip the card to the appropriate circuitry. It seems only Mirror thinks it's worth the trouble.

Display Software

Most of the monitors we tested require no software other than the Mac's own System software, but several provide software for additional features such as pop-up or tear-off menus. You can toggle most such features on and off from the keyboard. The Mirror Technologies PixelView I comes with Desktop Designer, a cdev that provides pop-up menus, a larger cursor and menu bar, and a screen saver.

Radius' RadiusWare software controls the pivot feature in addition to providing enlarged fonts in menu names, tear-off menus, a screen saver, and a screen-capture utility that saves in PICT2 format. RadiusWare's Dynamic Desktop reorients your screen immediately after you rotate the Pivot. If you lose access to your window borders in the new orientation, simply

Figure 2: Overall Image Quality



According to the eyes of our jurors and an objective CCD (charge-coupled device) array, the Apple Portrait Display won after we'd computed all the results — including those for brightness, MTF sharpness, focus, geometry, and lack of nuisances. We ranked the monitors from best to worst overall.

We measured the brightest setting at which each monitor remained in focus. The Apple Portrait Display was the brightest of all, with the Radius Pivot a close second. The three identical monitors from Cutting Edge, Ehman, and Mirror tied for dimmest.

We used a 300-dpi CCD array to objectively measure each screen's sharpness. The Apple Portrait Display again came out on top with an MTF (modulation-transfer function) rating of 77 percent out of a possible 100 percent.

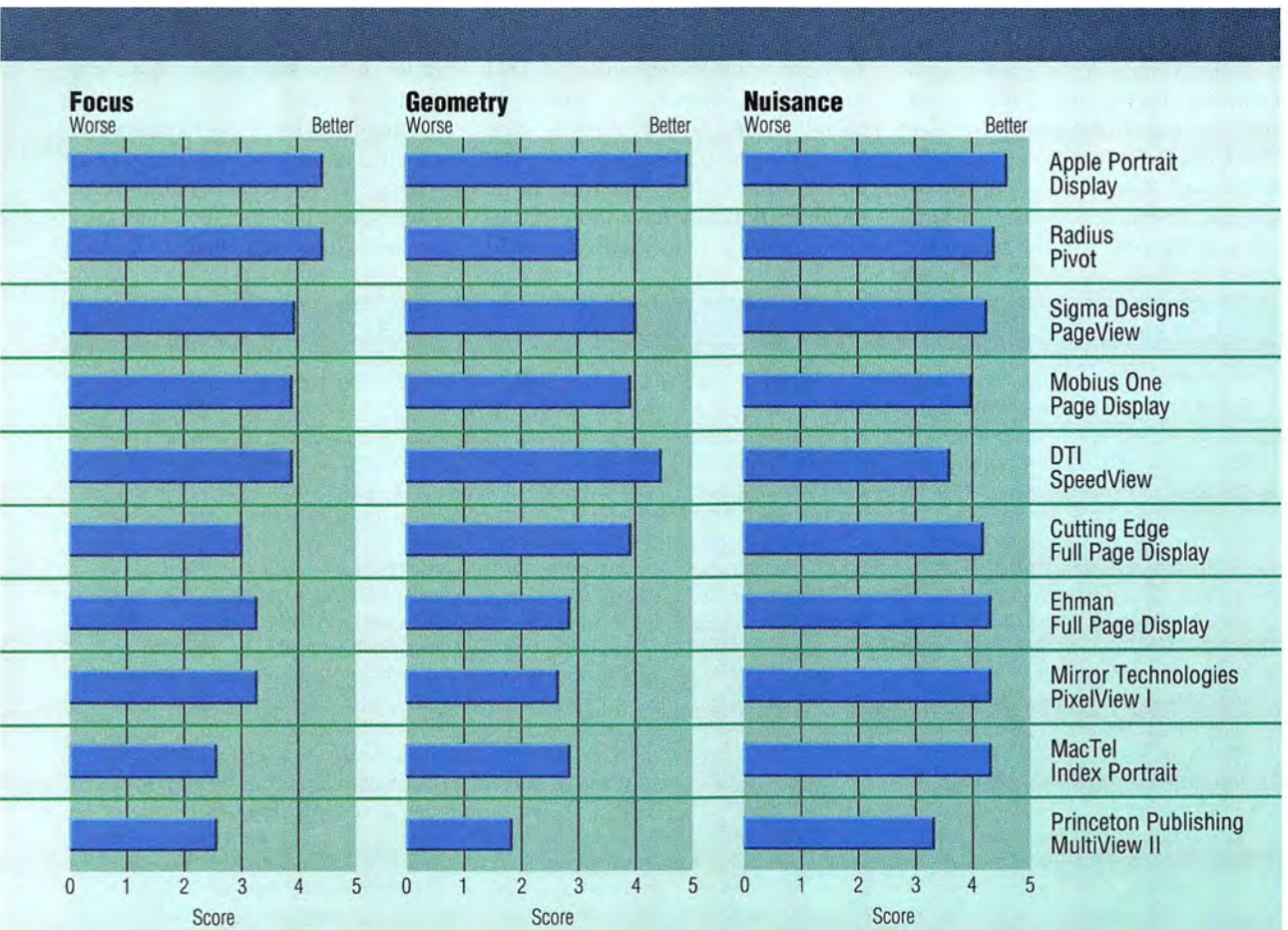
hold down the Option key and click on your window's title bar to zoom your window to the new orientation.

Mobius has software for the SE only, called Multiscreen, that you access through the Control Panel. In addition to providing various other options, Multiscreen lets the SE act as an extension of the big screen, thereby enlarging the desktop. It also provides a screen saver, pop-up menus, a large cursor, and a magnifier, and its Accelerator portion turns acceleration on or off. The Mobius system lets you speed up your SE whether you're using the Mobius monitor or not; your software will run about twice as fast. The Sigma Designs PageView, the only monitor with multiple resolutions, comes with a cdev that lets you set the monitor to 72, 80, or 88 dpi.

Sharp Screens

Features aside, the most important consideration when buying a monitor is how the display looks. When our jury judged subjective monitor characteristics such as geometry, focus, and glare and other nuisance factors, it again proved the old adage that you get what you pay for: The monitors with the best displays cost the most. The Apple Portrait Display was the overall winner, with the Radius Pivot and Sigma Designs PageView second and third, respectively (see Figure 2).

Poor screen geometry — the inability of a screen to display squares as squares and circles as circles — causes



A monitor with bad focus blurs thin lines, and small fonts become unreadable. Focus is usually worse at the edges than in the center of a screen. The Apple Portrait Display and the Radius Pivot tied for the title of sharpest full-page display.

Poor geometry can cause eyestrain and skew architectural drawings. The Apple Portrait Display again came out on top, with the 21-inch DTI SpeedView a surprising second. Being a larger monitor — 21 inches versus the others' 15 inches — the SpeedView faces a greater challenge in maintaining geometric linearity.

Nuisance is the sum of all that can diminish your viewing pleasure: glare, jitter, flicker, and noise. Only the Princeton Publishing MultiView II did badly in this test — we wouldn't want to work with it all day, every day.

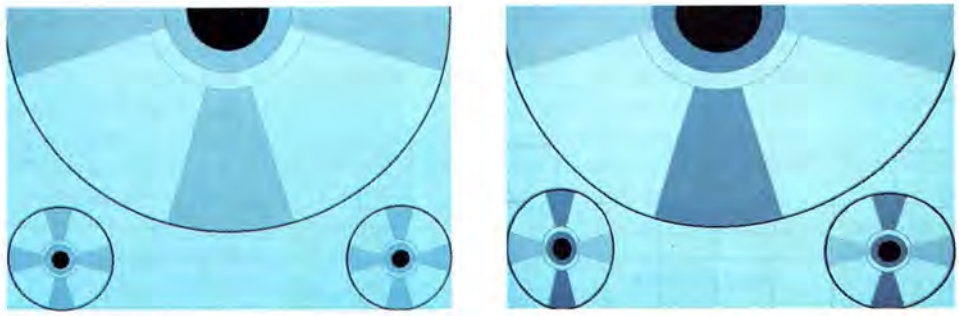


Figure 3: The geometric linearity test pattern taxes a monitor's ability to faithfully display the circles and cross hairs. The Apple Portrait Display (left) is the most faithful, and the Princeton Publishing MultiView II (right) is the least.

eyestrain and can result in imprecision in tasks such as freehand drawing. We checked geometric linearity by using a modified version of a shareware program that, among other things, generates a test pattern reminiscent of a late '50s Civil Defense warning (see "Do-It-Yourself Screen Tests" in this issue). The test image consists of a large circle in the center of the screen and smaller circles in each corner. Monitors with good geometry, such as the Apple Portrait Display, the Sigma Designs PageView, and the DTI SpeedView, display five perfectly round circles (see Figure 3). The SpeedView's performance is especially impressive, because large monitors typically have more geometry problems than relatively small 15-inch models. Monitors with poor geometry, such as the Princeton Publishing MultiView II, elongate the circles so they look more oblong and squat than round.

A monitor with excellent sharpness, or focus, can prevent your fine art from looking like Rorschach inkblot tests. When pixels blur together, thin lines can look fuzzy and small font sizes

On the Horizon

For those of you who aren't satisfied with just a full page on your screen, there's good news. Since our last monochrome-display-system roundup (see "A Study in Black and White," April '90, page 182), several new two-page displays have appeared on the market, and some new full-page displays were released after we completed our tests. For the true futurist, there's also an exciting new display technology that should interest anyone who's run out of desk space.

Three new full-page displays should be shipping by the time you read this. Micro Display Systems' Genius features 80-dpi resolution, pixel dimensions of 640 x 872, and a refresh rate of 68 hertz. The SE and SE/30 model sells for $815, and the Mac II-line model costs $866. Micro Display has also announced a two-page display, the Genius 1900, with 72-dpi resolution, pixel dimensions of 1,152 x 872, and a refresh rate of 68 hertz. The Genius 1900 will support the SE, the SE/30, and the Mac II line. Micro Display Systems, 755 E. 31st Street, Hastings, MN 55033; (800) 328-9524.

Nutmeg Systems is introducing a revision to its full-page display that makes the portrait display compatible with the SE, the SE/30, the Mac II family, and the new LC and IIsi. The company is also planning a full-page display for the Classic.

A third full-page-display system from Software and Hardware That Fits boasts a low price. Board and monitor together will sell for $579, and the monitor alone — to be driven by the on-board video in the IIci and IIsi — costs only $395. Software and Hardware That Fits, 20200 Eastway Village Drive, Suite 100, Humble, TX 77338; (800) 972-3018 or (713) 540-2300.

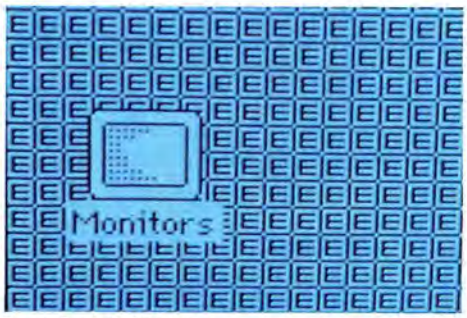
For some time now, PCPC has been promising the color Flipper monitor, a 17-inch display that has both portrait and landscape orientations, controlled with a simple twist, and 8- or 16-bit color. The color Flipper will be priced at $2,495 for 8-bit color and $2,995 for 16-bit color. PCPC plans volume shipments by the beginning of 1991. PCPC, 4710 Eisenhower Blvd., Building A4, Tampa, FL 33634; (800) 622-2888 or (813) 884-3092.

Moniterm has recently introduced a low-cost, high-resolution 20-inch monochrome monitor, the Viking 3/72M. This two-page display features 72-dpi resolution, pixel dimensions of 1,024 x 768, and a flicker-free 78-hertz refresh rate. The system comes complete with controller card for the Mac II family, the SE, or the SE/30; a tilt-and-swivel base; and an antiglare etched panel (OCLI filter optional). The Viking 3/72 will be priced at $1,295. Moniterm, 5740 Green Circle Drive, Minnetonka, MN 55343; (612) 935-4151.

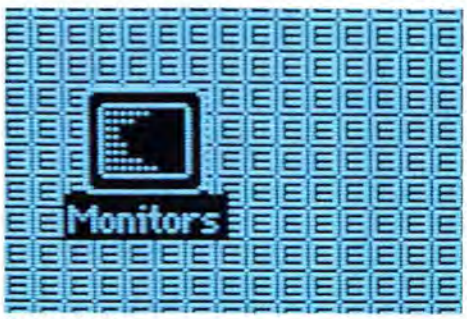
If your desk is so overcrowded with computer peripherals that you have no place to work, you'll be pleased to hear that Planar Systems has just announced the first EL (electroluminescent) display for the Mac. The 19-inch flat-screen EL display weighs less than 15 pounds and takes up less than half the space of a keyboard. The EL display is also portable, and because it's completely solid-state, it's less fragile than a CRT. Technological advances don't come cheap, however: Planar is selling the monitor direct for $5,000. (Look to see the prices drop in the next couple of years.) Color EL displays are also in the works and may even become less expensive than their CRT counterparts. Planar Systems, 1400 N.W. Compton Drive, Beaverton, OR 97006; (503) 690-1100.

Nutmeg Systems will soon introduce its own flat-panel display that uses LCD (liquid-crystal display) technology. It will have pixel dimensions of 640 x 870 and will use a backlit LCD (unlike the unlit Mac Portable). The display will be less than an inch deep, for the space-conscious. The shipping schedule should be announced by the time this article is in print, and the price should be comparable to that of other two-page monochrome displays. Nutmeg Systems, 25 South Avenue, New Canaan, CT 06840; (203) 966-3226.

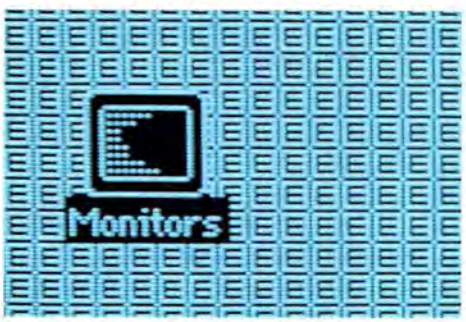
— Darryl Chan



Apple Portrait Display



Radius Pivot



MacTel Index Portrait



Princeton Publishing MultiView II

Figure 4: If you can't read the small text on your screen, it's time for a new monitor with sharp focus. The Apple Portrait Display and the Radius Pivot have the sharpest displays we've seen, and the MacTel Index Portrait and Princeton Publishing MultiView II have the fuzziest.

may be unreadable. Focus is rarely as good at the edges of a monitor as it is in the center, and it is rarely uniform in all areas of a large CRT at the same time. Our jury gave equally high marks to the Apple Portrait Display and the Radius Pivot displays and gave the lowest scores to the MacTel Index Portrait and the Princeton Publishing MultiView II (see Figure 4).

Screen brightness is a measurement of how intensely an image is projected on a monitor, whereas contrast is the relative difference between the light and dark areas. One cause of eyestrain is poor contrast between text and background. Brighter images do not necessarily make sharply focused images, however. To measure brightness, we did more than just turn the contrast knob as far as it would go and measure maximum output, because increasing the intensity of an electron beam makes it wider, allowing it to spill over into adjacent pixels. Instead, we measured maximum *usable* brightness, the brightest setting that can be kept in focus. The Apple Portrait Display and Radius Pivot were nearly twice as bright as the Cutting Edge, Ehman, and Mirror display systems.

Glaring Problems

Glare, one of many nuisance factors, is room light that bounces off your screen. Our jury evaluated these factors for each monitor and gave each an overall nuisance score.

Under some lighting conditions, monitors with untreated surfaces reflect as much as a mirror does — especially if you're required to wear a white shirt at work. One antiglare technique is to etch the monitor, as Mirror does with the PixelView I. An etched screen provides moderate glare protection, but it may cause perceived focus to suffer — the etched surface diffuses not only the light bouncing off the screen but also the light emanating from the screen.

Another common nuisance is flicker, a faint pulsing of the screen image. Flicker is caused by the combination of a low vertical scan rate and a short-persistence screen phosphor. Ideally, the electron beam that "paints" the display sweeps across the inner face of the tube (left to right, top to bottom) fast enough that the pixels that should be on remain glowing until the next pass of the beam. If the refresh rate is too slow and the phosphors begin to dim, successive screens don't blend completely and your eyes see each screen being replaced by the next. A vertical scan rate of 65 hertz (meaning the screen is refreshed 65 times per second) is generally considered sufficient to eliminate flicker. All the monitors we tested have a refresh rate of at least 69 hertz, and all scored very high for lack of flicker.

Jitter and noise both show up as squiggling pixels, but the sources of these problems are different. Generally, jitter is the fault of poor monitor electronics or voltage irregularities when a disk drive is accessed. None of the monitors we tested exhibited significant jitter. Noise, on the other hand, is an environmental problem. All monitors are susceptible to noise generated by EMI (electromagnetic interference). The biggest sources of this problem are transformers, AC motors such as those in vacuum cleaners, and other monitors. Although it's unlikely that you'll mount your monitor next to an AC motor (disk drives use DC), you should make sure to distance your monitor from transformers such as the one in your modem's power adapter. And you

might want to scoot your monitor away from your SE, because compact Macs spew EMI from their left sides — the sides with all the high-voltage video circuitry. Radius took this into account when designing the Pivot and wrapped the CRT in an aluminum-alloy shield to protect it from EMI. The Sigma Designs PageView, on the other hand, is extremely susceptible to EMI and must be kept at least a foot away from offending Macs.

To objectively measure screen sharpness, we measured the horizontal and vertical MTF (modulation-transfer function) of each monitor, using a 300-dpi CCD (charge-coupled device) array. Jargon aside, we used a custom-made gadget to compare the contrast of one-pixel-wide black and white lines with larger areas of white and black. A monitor with perfect (100 percent) MTF sharpness would display vertical and horizontal stripes with perfect contrast. The Apple Portrait Display achieved the highest MTF score, followed closely by the Radius Pivot. Focus and MTF scores don't necessarily correlate. Take the case of the MacTel monitor, which our jury rated near the bottom of the heap. The human eye sees focus as a combination of MTF sharpness and brightness.

Big Brother

The DTI SpeedView is a portrait monitor in a class of its own — it's a full-page system capable of displaying a mighty big page. Measuring 21 inches diagonally, the SpeedView was designed especially for newspaper work, but anyone working on tall, tabloid pages — art directors or graphic designers, for example — will appreciate having a large image area and a portrait orientation to save them from chronic up-and-down scrolling. The SpeedView's display resolution is 72 dpi, so serious publishers can also take advantage of true WYSIWYG.

It's unfair to compare the SpeedView with the 15-inch monitors, because a larger monitor comes with a different set of problems. Because of its size, a larger tube can't be expected to deliver the same uniformity of focus, brightness, and contrast that a smaller CRT does. For example, larger monitors typically have geometry problems, especially at the outer edges of their displays. You would also expect to see more flicker, again because of the size.

Surprisingly, though, the DTI SpeedView performed well in our tests, coming in fifth. Its screen-geometry quality was second only to that of the Apple Portrait Display, and its 72-hertz refresh rate was enough to keep it flicker-free. The SpeedView showed no signs of jitter at all, and its glare was also minimal. DTI has done an impressive job of creating a high-quality large portrait monitor.

Conclusion

You don't need to do a lot of fancy mousework to quickly tire of scrolling around a 9-inch screen. Even for the simplest word-processing or financial tasks and especially for page-layout chores, it's a lot more inviting to see the whole picture — the complete, full page — on a large screen. A full-page display gives you about 70 percent more viewing pleasure than does a Plus, SE, Classic, or SE/30 display but without cutting as wide a swath through your finances as a two-page gray-scale or color monitor.

Prices start at less than $500, but the right monitor may not be just the least expensive — which monitor will *you* want to look at all day? Trim your selection down to a winner and two or three runners-up (see the "Bottom Line" sidebar) before going to the store.

Kelli Wiseth is a *MacUser* associate editor whose Mac has both a 19-inch and a 13-inch color monitor.

The Bottom Line

Whether you've just bought your first Mac or want to upgrade your present Mac system, a full-page display may be all the screen real estate you need. The ten displays we tested all display a full 8.5-x-11-inch page. One display even shows you a full tabloid-sized page.

We put the monitors through a battery of objective and subjective tests and looked at their software and display quality. There were some clear standout full-page displays we wouldn't hesitate to buy.

The **Apple Portrait Display** ($1,698) is the best full-page display we tested, with superior geometry and focus, the highest MTF rankings, and the fewest nuisance factors. It is, however, the most expensive monitor in the 15-inch pack, costing more than three times as much as the Ehman Full Page Display — and Apple asks an extra $89 for a tilt-and-swivel stand. You can get a Mac Classic and an Ehman display for less than the Portrait Display. But if you can afford it and must have the best, the Portrait is the hands-down choice.

Another monitor that impressed us is the **Radius Pivot** ($1,690), a high-quality display with great focus and excellent brightness. It's expensive, but you're also paying for a special feature: the ability to rotate 90 degrees between portrait and landscape orientation. If you have the need for landscape capability, get the Pivot.

If you're upgrading your SE display, you'll find the **Mobius One Page Display** ($795) to be a great performer at a great price. The card that comes with the SE model includes a CPU accelerator that speeds up all processing. The monitor comes with an antiglare coating, and the SE model comes with software for tear-off menus, a large cursor, and an image magnifier.

The **Ehman Full Page Display** ($499) is well worth the investment. Although its performance in our tests was not up to that of the more expensive monitors, it's debatable whether the Apple Portrait Display, which is three times as expensive, is really three times as good. The Ehman display is identical to the Cutting Edge Full Page Display and the Mirror Technologies PixelView I, both of which are more expensive.

The **DTI SpeedView** ($2,495) is designed for professional publishers who need large screen acreage to view a full tabloid page in its entirety. Although larger tubes usually can't be expected to deliver the same image quality as smaller 15-inch ones, the SpeedView actually scored higher than many of the smaller portrait displays. This is a good monitor for those who need the extra viewing space.



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Table 1: Features of Full-Page Displays

15-inch displays







● = yes ○ = no	**Apple** **Portrait Display** ★★★★½	**Cutting Edge** **Full Page Display** ★★★	**Ehman** **Full Page Display** ★★★½	**MacTel Technology** **Index Portrait** ★★★	**Mirror Technologies** **PixelView I** ★★★½
Comments	The clear winner, with the best image of any display. Expensive.	Same monitor as Ehman but $400 more. Average image quality.	Least expensive display. Average image quality. Good bargain.	More expensive than Ehman display with no additional benefits.	Same as Ehman display and almost the same price. Only solution for Plus owners.
List price					
For Mac Plus	NA	NA	NA	NA	$567
For SE	NA	$899	$499	$625	$567
For SE/30	NA	$899	$499	$625	$567
For Mac II family	$1,698	$899	$499	$625	$567
Monitor specifications					
Tube manufacturer	Toshiba	Clinton	Clinton	Sunkyong	Clinton
CRT (diagonal)	15 in.	15 in.	15 in.	15 in.	15 in.
Active screen (diagonal)	13.5 in.	13.9 in.	13.9 in.	13.7 in.	13.9 in.
Dimensions (W x H)	640 x 870 pixels	640 x 870 pixels	640 x 870 pixels	640 x 870 pixels	640 x 870 pixels
Resolution	80 dpi	80 dpi	80 dpi	80 dpi	80 dpi
Vertical-scan rate	75 Hz	75 Hz	75 Hz	75 Hz	75 Hz
Horizontal-scan rate	68.85 kHz	68.85 kHz	68.85 kHz	68.85 kHz	68.85 kHz
Gray levels	2, 4*	2	2	2	2
Other					
Glare treatment	silica coating	NA	NA	antiglare coating	etched
Tilt-and-swivel stand	optional ($89)	●	●	●	●
Brightness/contrast knobs	side	front	front	side	side
Software	○	●	●	●	●
Dimensions (W x H x D)	11.5 x 15 x 14.25 in.	12 x 16 x 14 in.	12 x 16 x 14 in.	11.8 x 16.3 x 12.9 in.	12 x 16 x 14 in.
Weight	35 lb	23.8 lb	23.8 lb	23.8 lbs	42 lb
Warranty	90 days	1 year	1 year	1 year	1 year
	Apple Computer 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	Cutting Edge 97 S. Red Willow Rd. Evanston, WY 82930 (307) 789-0582 (307) 789-8516	Ehman Engineering, Inc. 97 S. Red Willow Rd. Evanston, WY 82930 (800) 257-1666	MacTel Technology 3007 N. Lamar Austin, TX 78705 (800) 950-8411 (512) 451-2600	Mirror Technologies 2644 Patton Rd. Roseville, MN 55113 (800) 654-5294 (612) 633-4450

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Two years ago, they called our Business LaserPrinter™ "The future of PostScript.®" Last year, they gave our PLP™ II the *MacUser* Editors' Choice Award. But this time, we're really giving them something to study. Because now, we've done what was considered impossible. We've produced a printer that dramatically outperforms the Apple® LaserWriter® IINT, at half the cost: the $2299* Business LaserPrinter II (BLP™ II).

PostScript For Less.

This is the printer you've always wanted, at a price you never thought you'd see. With true Adobe™ PostScript and built-in AppleTalk®, you and everyone else on your Macintosh® network can immediately start producing the highest quality, 300 dots-per-inch (dpi) graphics and text using your favorite software. You even get the same 35 fonts as you get with the Apple LaserWriter. But now, the real lesson begins.

Better At Any Price.

Even if money were no object, the BLP II would still be the printer of choice. It has 2 megabytes of RAM, user expandable to 4, plus a high-speed processor so it can image your document almost twice as fast as the IINT. And unlike the competition, the BLP II's SCSI port boosts performance and provides access to unlimited on-line fonts. Want more? How about a small footprint and silent sleep mode. Edge-to-edge printing. User-friendly LCD front panel display, cost-saving toner recycling system, and our advanced QuickEnvelope™ software that makes printing envelopes a snap. Still not enough?

The Fast Track: BLP IIS.

Maybe you have a large network, with a heavy print load. A network you thought required the speed, power and price tag of a LaserWriter IINTX. Well, think again. Because the BLP IIS gives you performance rivaling the IINTX at less than half the cost: an 8-page-per-minute printer for just $2799.* Whether you choose the BLP II or the BLP IIS, you get compatibility not only with Macintosh, but with IBM® and compatibles, using PostScript or the optional LaserJet II emulation. And you get it fast.

Dealer or Direct: Your Choice.

Just call us toll-free. We'll give you the name of your nearest GCC Technologies dealer. Or order direct from us, with a 30-day money-back guarantee and $9 overnight delivery. And now, with our factory-direct rebate of $100 on both the BLP II and BLP IIS, your purchase is even smarter.

800-422-7777.

GCC TECHNOLOGIES
Peripherals With Vision.™

*Price reflects $100 factory-direct rebate when purchased from an authorized GCC dealer or directly from GCC through January 31, 1991. GCC dealers are independent businesses and as such they may offer different prices, policies, and service arrangements. In Canada call 800 263-1405. © 1990 GCC Technologies, Inc.

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Please circle 96 on reader service card.

12102B

Table 1: Features of Full-Page Displays, continued

	15-inch displays				21-inch display
					
● = yes ○ = no	**Mobius Technologies One Page Display** ★★★★	**Princeton Publishing MultiView II** ★★½	**Radius Pivot** ★★★★	**Sigma Designs PageView** ★★★½	**DTI SpeedView** ★★★★
Comments	The choice for SE owners because the interface card is also a CPU accelerator.	The worst monitor we reviewed. High price too.	Unique pivot feature. Good performance. High price.	Good performance. Pricey. Only monitor to offer variable resolution.	Only display that shows a tabloid page without scrolling. Good performance.
List price					
For Mac Plus	NA	NA	NA	NA	NA
For SE	$795	$845	NA	$1,299	NA
For SE/30	$795	$845	$1,690	$1,399	NA
For Mac II family	$795	$995	$1,690	$1,399	$2,495†
Monitor specifications					
Tube manufacturer	Zenith	Clinton	Philips	Clinton	Sigma Designs
CRT (diagonal)	15 in.	15 in.	15 in.	15 in.	21 in.
Active screen (diagonal)	13.7 in.	13.9 in.	13.8 in.	13.4 in.	20 in.
Dimensions (W x H)	640 x 870 pixels	640 x 870 pixels	640 x 864 pixels	variable	870 x 1,152 pixels
Resolution	78 dpi	76 dpi	78 dpi	72, 80, and 88 dpi	72 dpi
Vertical-scan rate	75 Hz	75 Hz	69 Hz	80 – 97 Hz	72.3 Hz
Horizontal-scan rate	68.8 kHz	15 – 70 kHz	65 kHz	79 kHz	86.8 kHz
Gray levels	2	2	2, 4*	2	2, 256†
Other					
Glare treatment	antiglare coating	optional ($75)	NA	optional ($100)	○
Brightness/contrast knobs	front	bottom, side	side or top	front	front
Tilt-and-swivel stand	●	●	●	●	●
Software	●	○	●	●	○
Dimensions (W x H x D)	12 x 17 x 14 in.	11.6 x 15.6 x 14 in.	12.25 x 17.75 x 14.75 in.	11.15 x 15.25 x 14.5 in.	17.5 x 19 x 18 in.
Weight	36.5 lb	23 lb	35 lb	22 lb	69 lb
Warranty	1 year	1 year	1 year	1 year	1 year
	Mobius Technologies 5835 Doyle St. Emeryville, CA 94608 (800) 669-0556 (415) 654-0556	Princeton Publishing Labs 19 Wall St. Princeton, NJ 08540 (609) 924-1153	Radius 1710 Fortune Dr. San Jose, CA 95131 (800) 227-2795 (408) 434-1010	Sigma Designs 46501 Landing Pkwy. Fremont, CA 94538 (415) 770-0100	DTI 500 W. 1200 S. Orem, UT 84058 (801) 226-2984

*Optional upgrade to 16 levels

†Gray-scale model, $3,195

THE FIRST LASER PRINTER TO COMBINE HIGH STANDARDS AND LOW COST. THE $1299* PLP II.



Now you can have everything you ever wanted in a laser printer. Without paying the price.

Introducing the lowest priced laser printer in history: the $1299* PLP™ II from GCC Technologies. GCC developed the very first personal laser printer in 1987, and has over 20,000 satisfied users... more than everyone else combined.

Finally, a revolutionary printer at a revolutionary price. In fact, at $1299,* it's nothing short of a technological marvel.

Personal Desktop Printing.

Three years of research and development have put the finest printer technology right on your desktop: a combination of the newest third generation laser engine, GCC's own custom designed integrated circuits, and the market's most sophisticated QuickDraw™ imaging software yet.

Features such as a silent "sleep" mode, a very user-friendly LCD display and an envelope printing desk accessory have been carefully integrated. In the future, should your needs include PostScript,® there's even a user-installed upgrade.

The Highest Quality Printing.

Because PLP II includes 6 outline font families (for a total of 22 individual fonts), its razor-sharp, clean output can be shaped, scaled, and rotated to any point size—all at a full 300 dpi.

These outline fonts, combined with GCC's powerful QuickDraw imaging software, give you unlimited flexibility in producing perfect documents from such applications as PageMaker,® Word,® Excel,® MacWrite,® MacDraw,® Persuasion,® and Canvas.®

Even More Power: PLP IIS.

For those who demand even more power, there's also the PLP IIS.

With the PLP IIS, you get all the breakthrough technology of the PLP II, only now, you get it at a swift 8 pages per minute, making it the perfect solution for anyone printing a high volume of output.

You also get one megabyte of RAM, which can save you valuable time. For example, while PLP IIS is printing, your Macintosh can be processing the next page of your document.

And finally, with PLP IIS, you get a very powerful font library. In addition to the core set of 22 Bitstream® outline fonts, you also get a font package called Font Plus,™ which means you'll have over 40 fonts to choose from.

Dealer or Direct: Your Choice.

GCC has made acquiring your new PLP II or IIS just as easy as using it.

Simply call us toll-free, and we'll give you the name of your nearest GCC Technologies dealer. Or order direct from us, with a 30-day money-back guarantee and $9 overnight delivery. And now, to celebrate our tenth anniversary, we'll even send you a factory-direct rebate of $100 on both printers.

800-422-7777.

We gladly accept MasterCard, Visa, American Express, or your company's corporate purchase order.

PLP II $1299;* PLP IIS $1799.*

GCC TECHNOLOGIES

Peripherals With Vision.™

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MacAvenue's Protegé Meets the Toughest Demands

...Want a Second Opinion?

We can't guarantee that a MacAvenue Protegé drive will make you successful. But we *can* assure you that the Protegé is engineered to be the best hard drive available.

Want a second opinion? *MacUser* magazine's respected business columnist, Robert Wiggins, calls it a "great total package: hardware, software and documentation. MacAvenue's Protegé drives are an excellent value — my highest recommendation."



ROBERT WIGGINS

Robert Wiggins, *MacUser* magazine's business columnist recommends the Protegé.

The Protegé Means Business!

If we can satisfy a demanding Mac power user like Robert Wiggins, we know we've got a good shot at satisfying you, too.

BEST SERVICE AND SUPPORT

We back the Protegé with the best technical support available anywhere! If you have a problem with your Protegé drive, give us a call at 1-800-766-6221. We'll send a replacement by Federal Express for next-day delivery, at no cost to you. With this service along with competitive pricing on drives from 20- to 100+MB, and the option of Seagate or Quantum mechanism, it's no wonder the Protegé is so popular with Macintosh users.

SMART DRIVE

Your Protegé will arrive pre-formatted and ready for work. Our DiskMaster™ disk management software lets you create partitions and password-protect each partition. The Protegé is backed by a 30-day, no-questions-asked, money-back guarantee, a one-year limited warranty (two years on Quantum systems) and toll-free technical support. Whichever MacAvenue Protegé drive you choose, you'll definitely get a "best buy." And the best drive.

FIND LOST FILES FAST!

The MacAvenue Protegé comes bundled with **OnLocation**, the amazing file-finding utility that will search your entire hard drive and find a lost file in seconds.
A $129.95 value — Free!

Exclusive!





Protegé Hard Drives

Capacity	External		Internal	
	Seagate	Quantum	Seagate	Quantum
20+MB	$345	n/a	$295	n/a
40+MB	$395	$455	$325	$375
80+MB	$525	$645	$465	$595
100+MB	n/a	$695	n/a	$645



Call 800-753-6221 for FREE catalog!

MacAvenue™

A Division of CompuAdd Corporation

12303 Technology Boulevard — Austin, Texas 78727

Key Code 872

For More Information Call: **800-753-6221**

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"Let's Talk About Value"

Value is a tricky concept. Any company can promise value — and most do. But too often what the word means to the company and what the word means to you are two quite different things. When MacAvenue uses the word, the very least it means for you is great prices on a wide selection of Macintosh products. It also means Federal Express delivery overnight for $2 and an outstanding product warranty. For example, if you have a problem with your MacAvenue Protegé drive (or *any* product we carry) and we can't solve it over the phone, we'll Fed Ex you a replacement overnight — at no charge to you!

Every company claims it has "great tech and customer support". When MacAvenue makes that claim, we can back it up not only with our knowledgeable and friendly staff, but also with the expertise and resources of our parent company, CompuAdd — the company that was judged first in customer satisfaction, value for price and quality over 24 other PC manufacturers!*

With all this, we also offer you toll-free access to product information via our MacsFax™ information line, our FastLane™ leasing program for businesses and MacAvenue-exclusive hardware designed by our own engineers for quality and performance.

Recently we've come up with another great value for our customers: software bundles that offer hundreds of dollars of Macintosh software for less than $50. Just another MacAvenue exclusive that tells you we know what the word "value" really means.

Michael Shapiro

Michael Shapiro
General Manager, MacAvenue

MacAvenue™
A Division of CompuAdd Corporation

**The Score Report: Personal Computer Customer Satisfaction.* From Dataquest, a company of the Dun & Bradstreet Corporation.

MacAvenue: More Than A Source, A Resource...

Protegé — The Best Drive in the Business



Top-notch engineering makes the **Protegé** cool, quiet and reliable — the best hard drive for your Macintosh. With features like external termination, push-button SCSI address selector and Disk Master™ Disk Management Software, the **Protegé** is easy to operate. Bundled with **OnLocation**, the best file-finding utility — a $129.95 value — Free!

"MacAvenue's inexpensive 100MB Protegé hard drive is far and away the best value for your mass storage dollar currently on the market."
— Steven Bobker, *MacUser* Columnist

100MB Protegé (Quantum) 24392 $695
MacAvenue Protegé Carrying Case 26908 $24

See listings below for more Protegé drives

Hardware

STORAGE DEVICES

See our ad featuring the high-performance MacAvenue Protegé hard drives.

Applied Engineering
24735 3.5" 800K Floppy Drive $205
24736 High-Density 3.5" 1.44K Floppy Drive $239
Dayna
24732 DaynaFile 1.2MB DF0200 $550
24738 DaynaFile 360K DF0100 $519
24733 DaynaFile 360K/1.2MB DF0102 $725
24737 DaynaFile 360K/1.44MB DF0104 $745
Fujitsu
24731 800K Floppy Drive $157



Hot New SCSI/Ethernet Interface

Connect your Mac to Ethernet with the **NuvoLink SC** from Nuvotech. This SCSI to Ethernet interface installs quickly and operates transparently at 10 Megabaud. Makes file transfers and E-mail fly. **NuvoLink SC** works with the new Mac Classic and is 10BASE T compatible with the addition of a third-party transceiver.

NuvoLink SC (Nuvotech). 22535 $319

Iomega
24384 Bernoulli 40-40 $2195
23834 Mac 1B Interface Kit $48
24385 Portable 44MB $1429
24393 TransPortable 44MB $999
Kennect Technology
24740 360K 5.25" Drive $299
24730 Drive 2.4 (3.5") $325
Pace
26908 Protegé HD Carrying Case $24
Quantum
24390 40MB External Protegé $455
24191 40MB Internal - (IIcx,ci) $375
24188 40MB Internal - (SE-IIx) $375
24391 80MB External Protegé $645
24192 80MB Internal - (IIcx,ci) $595
24189 80MB Internal - (SE-IIx) $595
24392 105MB External Protegé $695
24193 105MB Internal - (IIcx,ci) $645
24190 105MB Internal - (SE-IIx) $645
Seagate
24380 20MB External Protegé $345
24184 20MB Internal - (IIcx,ci) $295
24180 20MB Internal - (SE-IIx) $295
24381 40MB External Protegé $395
24185 40MB Internal - (IIcx,ci) $325
24181 40MB Internal - (SE-IIx) $325
24382 80MB External Protegé $525
24186 80MB Internal - (IIcx,ci) $465
24182 80MB Internal - (SE-IIx) $465

PRINTERS, SCANNERS AND FAXES

Adobe
38432 Postscript for LJ-II $299
Complete PC
22752 Complete Halfpage Scanner $313
22753 Complete Page Scanner $758
Dest
22762 Personal Scan $699
22764 Personal Scan w/ Recognize! $1595
Digital Vision
22758 Computer Eyes B/W $196
22759 Computer Eyes Color $344
Dove
22701 DoveFax-External $289
Epson
56339 Epson LQ-2550 - 24 pin printer $910
56340 Epson LQ-510 - 24 pin printer $289
56303 Epson LX 810 - 9 pin printer $185
Kodak
22855 M150 Mac Portable $519
38733 M150 Mac Portable Carrying Case $24.95
38341 M150 Mac Portable Ink Cartridge $12.95
Logitech
22751 ScanMan 32 $319
MicroTek-IMSI
22755 Microtek 300Z Color Scanner $1945
22756 Microtek MS-II B&W Scanner $1080
Orange Micro
22854 Grappler 9 Pin $79
22853 Grappler LX $129
Orchid
22702 OrchidFAX Modem $449
Relisys
22700 Tefax RA2110 $895
Seiko
22852 Label Printer $195
26902 Labels for Seiko Label Printer $11.99
Texas Instruments
22856 17 font microLaser w/ ATalk board $1795
22851 35 font microLaser w/ ATalk board $1995
25489 1MB microLaser Memory Upgrade $215
23058 2nd Drawer Feeder w/ Ltr Tray (grey) $325
23056 Envelope Feeder (grey) $299
23057 Legal Paper Tray (grey) $59
38311 microLaser Toner Cartidge $46
Thunderware
22761 Lightning Scan 400 $385
22757 Thunderscan Plus $199
22760 Thunderscan Power Acc. /II $44

COMMUNICATIONS-MODEM

Applied Engineering
22306 DataLink Express $169
22307 DataLink/Mac $205
22313 DataLink/Mac w/ MNP-5/Send Fax $275
Global Village
22311 Teleport Modem $134
Hayes
49578 Smartmodem 9600 $899
MacAvenue
49525 1200 External w/o SW $69
49557 2400 External w/o SW $109



CD-ROM Bonanza

The **NEC CD-ROM drive** gives you multi-platform and multi-format compatibility at a price that will make you look twice. This small footprint unit is complete with a compact disk offering **Type Gallery™ PS** — up to 470 Adobe PostScript™ language typefaces.

The **NEC CD-ROM drive with Type Gallery PS**. 24632 $625

More Monitor for the Money

MacAvenue's Protegé full-page and dual-page screens are comparable to Apple or Radius monitors that cost more than twice the MacAvenue price. You'll appreciate the great resolution, flicker-free refresh rates and other convenient features like tilt/swivel bases.

MacAvenue Protegé monitors:
Full-page 22010 $495
Dual-page 22011 $895



COMMUNICATIONS-NETWORK

Asanté
22538 MacCon+ IIE thk/thn $395
22529 MacCon+ IIET thk/UTP $395
22526 MacCon+ SE30E thk/thn $395
22531 MacCon+ SE30ET thk/UTP $395
22525 MacCon+ SEE thk/thn $295
22532 MacCon+ SEET thk/UTP $295
Dayna
22541 EtherPrint $360
Dove
22502 Fastnet III Ethernet Card $374
Farallon Computing
22511 PhoneNET® Connector DB-9 $31
22513 PhoneNET Connector Din-8 $31
22534 PhoneNET Din-8 to RJ11, 10pk $215
22517 PhoneNET Repeater $313



Ethernet Connector For LocalTalk Printers

Dayna **EtherPrint** takes the place of expensive routers or bridges to connect your LocalTalk printer to the Ethernet network. **EtherPrint** makes a simple "plug-and-print" connection with adaptors for any cable/printer combination.

EtherPrint (Dayna). 22541 $360

22512 PhoneNET StarConnector® $18
22515 PhoneNET StarConnector 10pk $138
22516 PhoneNET StarController® $888
22518 PhoneNET StarController (harmonica kit) $64
22514 PhoneNET to LocalTalk adapter cable $9
22519 Portable Pack $329
Interex
22520 Localtalk connector DB-9 to Din 3 $32
22521 Localtalk connector Din-8 to Din 3 $32
22522 Phone Connector DB-9 $23
22523 Phone Connector Din-8 w/ cable $25
Nuvotech
22536 Nuvolink II $279
22535 Nuvolink SC $319
Shiva
22508 Ethergate $1625
22510 FastPath 4 Gateway $1935
22505 NetBridge $339
22528 NetModem V.32 9600 baud $1425
22507 NetModem V2400 $435
22504 NetSerial X232 $275
22506 TeleBridge $339
Technology Works
22539 Mac II Ethernet Kit $275
22540 Mac II/10t Ethernet Kit $275
22527 Nodem (thin) $395
Tops
22503 Flashbox $117
22537 Flashcard $153

MONITORS AND VIDEO CARDS

See our ad featuring the new MacAvenue Protegé full-page and dual-page monitors.

MacAvenue
22011 Protegé Dual Page with card $895
22010 Protegé Full Page with card $495
Micron
23544 Mac II 8-Bit 1024X768 $585
23543 Mac II 8-Bit 640X480 $345
23542 SE/30 8-Bit 1024X768 $585
23541 SE/30 8-Bit 640X480 $345

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The Competitive Edge: Federal Express For $2

JUST FOR THE FUN OF IT (continued)

Broderbund Software
28680 SimCity Supreme (Mac II) $47
28678 SimCity v1.2 $28
28672 Where/Carmen Sandiego $28
28674 Where/Europe Carmen $28
28676 Where/USA Carmen $28
Casady and Greene
28752 Mission Starlight $29
28754 Sky Shadow $29
Centron
28758 Casinò Master $38
28760 Casino Master Deluxe $43
Electronic Arts
28654 Bard's Tale $30
28656 Chuck Yeager Flight Simulator $30
In-Line Design
28738 Bomber $30
PCAI
28708 MacGolf $33
Sierra-On Line
28724 Kings Quest 1 $28
28726 Kings Quest 2 $28
28728 Kings Quest 3 $28
Software Toolworks
28658 Life & Death $31
Spectrum Holobyte
28766 Faces $22
28614 Falcon v2.2 $30
28606 Tetris $20
28604 Welltris $19
Strategic Studies
28652 Reach for the Stars $25



3-D Graphics Made Simple

Use Paracomp's **SwivelArt** to create 3-D graphics for models and product prototypes. Easy to learn and includes more than 100 ready-made three-dimensional models.

Swivel Art (Paracomp). 29308 $82

SW Toolworks
28748 Chessmaster 2100 $31
XOR
28628 MacGolf Classic $51
28756 MacSki v1.0 $38
28630 NFL Challenge v1.2 $54





Master Your Correspondence

Address Book Plus 2.0 offers the most complete way to manage and print your names and numbers. **Letter Writer Plus** is a handy Desk Accessory that puts powerful letter-writing and mail-merge tools at your immediate disposal. The two programs work together for the the fastest and easiest mail merge.

Address Book Plus (Power Up) 2.0 30442 $59
Letter Writer Plus (Power Up). 30440 $54
Address Book Plus/Letter Writer Plus bundle. 29404 $85

The Graphic Arts

MOSTLY DRAWING

Adobe
29789 Illustrator v3.0 $348
29266 Photoshop v1.0.7 $498
Aldus
29784 Freehand v2.02 $326
Claris
29207 CAD 2.0 $639
Generic Software
29280 Generic CADD $372

MOSTLY PAINTING

Baseline
29310 Color MacCHEESE v1.05 $55
Claris
29202 Claris MacPaint 2.0 $94
Innovative Data Design
29241 MacDraft 2.0 $192
Silicon Beach
29224 Digital Darkroom V1.1 $247

MOSTLY GRAPHICS EDITING

Paracomp
29900 FilmMaker $437

PRESENTATION MANAGERS

Aldus
29782 Persuasion v2.0 $327
Macromind
29217 Macromind Director 1.01 $436
Symantec
30605 More v3.0 $265

CERTIFICATE AND AWARD GENERATORS

Broderbund Software
29836 Print Shop $35

GRAPHIC UTILITIES

Frame Technology
29864 FrameMaker Mac $745
HyperPress Publishing
30478 Icon Factory $45

GRAPHIC ART COLLECTIONS

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29846 Pack III: Presentations v1.0 $277
Desktops Graphics
29856 Borders and Graphics $45
29858 Business and Education $44
Multi-Ad Services
29876 ProArt Holidays $95
29878 ProArt Sports $95
29874 ProArt Trilogy (Business/Holiday/Sports) . $228
Paracomp
29308 Swivel Art $82

DO IT YOURSELF PROGRAMMING

MicroSoft
27590 QuickBasic $64
Spinnaker
27826 PLUS 2.0 $279
Symantec
27582 Just Enough Pascal v1.0 $48
27586 THINK C v4.0 $163
27584 THINK Pascal v3.0 v3.0 $160

OPTICAL CHARACTER RECOGNITION

Xerox
30636 AccuText 2.0 $541



Help for Excel Users

If you're baffled by **Microsoft Excel**, your worries are over! **Desktop Help for Excel** is like a private tutor with the answer to any question. This is the assistance you need to breeze through the most complex Excel spreadsheets.

Desktop Help for Excel
(Help Software). 28038 $48
Microsoft Excel 2.2 30180 $245



Create Professional Animation

FilmMaker from Paracomp gives you professional-quality animation with features such as real-time control over position, scale and rotation of animated objects, as well as full-screen anti-aliasing. And with the help of **FilmMaker** , your presentations also will take on new power.

FilmMaker (Paracomp). 29900 $437



MacAvenue's Fast Lane Leasing . . .
Our leasing program is the best way to keep the latest equipment in your workplace without tying up money in equipment purchases. Your agreement usually can be completed in one day, and we'll give you great rates that are easy on your budget. Call Today! 1-800-395-6221.

Instant Information with MacsFax . . .
MacAvenue's MacsFax is the fastest way to get authoritative information on any MacAvenue product. Dial our MacsFax number — 1-800-933-9002 — and within minutes, our computer will fax you spec sheets on selected MacAvenue products . We want you to have up-to-the-minute information because we're convinced that well-informed Mac buyers choose MacAvenue.





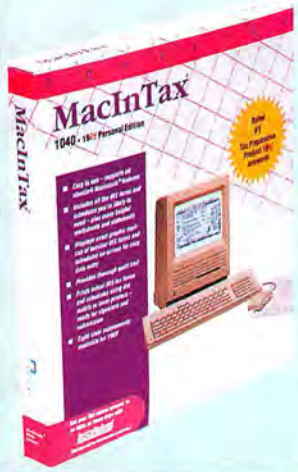
Unbeatable Service . . .
We guarantee every hardware product and every office accessory we sell. If you have a problem with any MacAvenue product, call our product support staff at 1-800-766-6221. If we cannot resolve the problem over the phone, we'll replace the product with equivalent merchandise and pay the Federal Express shipping both ways. You can be sure MacAvenue is the most reliable resource for Macintosh products.

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Mac Avenue

800-395-6221

Protegé Meets the Toughest Demands



Tax Help From MacInTax

Four-time *World Class* and *Eddy* award winner! **MacInTax** is the best-selling tax product for the Macintosh. Loaded with new features for 1990! And **MacInTax** is the only tax product available that prints exact replicas of IRS forms and schedules on blank paper. Full integration with 13 optional state supplements.

MacInTax (SoftView).
28502 $61



Make Third-Party Printer Connections

If you're looking for a way to connect a third-party, 24-pin printer to your Macintosh, the **Orange Micro Grappler LX** is the solution. Connects to Epson, Hewlett-Packard, Toshiba and other Epson 24-pin or HP LaserJet-compatible printers.

Grappler LX (Orange Micro). 22853 $129

Software

Writing and Publishing

WORD PROCESSING/WRITING

Ashton-Tate
30600 FullWrite Professional v1.5 $253
Microsoft
30582 Microsoft Word v4 $245
30584 Microsoft Write v1 $77
Nolo Press
29888 WillMaker v4.0 $34
WordPerfect
30591 WordPerfect Mac 2.0 $234

PAGE LAYOUT PUBLISHING

Aldus
29781 PageMaker v4.0 $497
Claris
29200 SmartForm Designer $291

UTILITIES FOR WRITERS/PUBLISHERS

DeltaPoint
30638 Taste $98
Lexpertise
30630 MacProof 3.2.1 $115
Lifetree
30632 Correct Grammar $49
Reference Software
30634 Grammatik Mac $50

FONTS AND FONT UTILITIES

Adobe
29834 Adobe Plus Pack v1.0 $119
29268 Streamline v1.2 $225
29830 Type Reunion v1.0 $38
29826 TypeAlign v1.0.4 $58
29825 TypeManager 2.0 $57
Broderbund Software
30450 Typestyler $115

Business Software

INTEGRATED/BUNDLED APPLICATIONS

Microsoft
30182 Microsoft Office Bundle $525
30580 Microsoft Works v2 $177

ACCOUNTING/BOOKKEEPING

ChipSoft
28500 Turbo Tax $51
DAC
28475 Easy Light Checkbook Acctounting v2.0 ... $41
Intuit
28458 Quicken v1.5 $39
Meca
28463 Managing your Money $139
Monogram
28465 Dollars & Sense v5.0 $86
ProPlus
28494 Wall Sreet Investor $395
Reality Software
28496 WealthBuilder $145
Softsync
28481 Accountant Inc. Professional $345
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28502 MacInTax 1040 Federal 1990 $61

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27790 FoxBase II v2.0 $292
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29904 Marketplace $525
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27798 Microsoft File v2.0A $123
MySoftware
27816 MyAdvanced MailList $27
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30442 Address Book Plus v2.0 $59
Preferred Pub's
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29906 Ventura Publisher $582

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27662 SmartCom II v3.1 $84
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27678 MS Mail Server $246
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27726 Prodigy Startup Kit $27
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27712 Faxgate Plus $237
SW Ventures
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27686 NetPrint v. 2.0 $115
27685 Tops Network Bundle/DOS $159
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MacPrint v1.2 (Insight). 30428 $94

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27970 Math Blaster Mystery $27
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28036 Word Munchers $29
Sensible Software
28010 Sensible Grammar $50
Simon & Schuster
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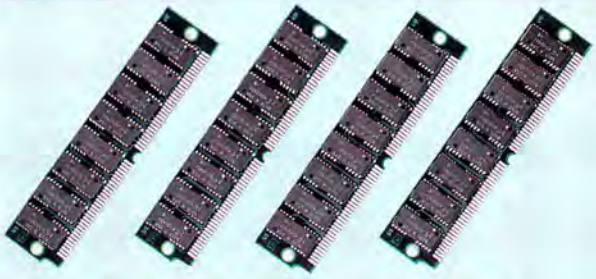
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23531 ColorBoard 264 $575
23539 ColorBoard 264/SE30 $685
23540 ColorBoard 364 $974
22007 Grey Scale 19" Monitor GS30 $1614
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22002 14" Color RGB $595
22009 20" CM-2050 Color Monitor $2395
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22000 Colormax 19" monitor w/ card $4645
22008 L-View Multi-Mode 19" w/ card $1495
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22101 PageView 15" w/ SE adapter $999
22106 PageView 15" w/ SE/30 adapter $1050
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Bay Electronics
25489 TI Laser Memory Upgrade $215
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26906 SIMMs Installation VHS Video $9
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25181 Mac-101 Keyboard Beige (Plus) $134
25183 SWITCHBALL $98
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25285 MacTrac (SE, II, IIgs) $75
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26895 Imagewriter II Dust Cover $8
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52655 Compact Personal Shredder PS 50 $119
Inland
40504 1 Mode Surge Protector $9.95
40505 3 Mode Surge Protector $14.50
Innovative Technology
26903 The Library (grey) $12
26905 The Library (black) $12
Interex
26890 A/B Box Din 8 $33
26281 Mac 128/512 to Hayes DB9 to 25pin, 6ft $7
26282 Mac 128/512 to Imagewrtr DB9 to 25pin $7
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26290 Mac to SCSI System Cable, 6ft $15
26904 MacAvenue Mouse Pad $4
26283 MacPlus Peripheral Adapter cable, 1ft $7
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26285 MacPlus, SE, II to Hayes Din 8 to 25pin $7
26286 MacPlus,SE,II to Imagewrtr DIN 8 to 25 $7
26287 MacPlus,SE,II to Imagewrtr II DIN 8/DIN 8 $7
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26289 SCSI Peripheral Cable, 2ft $13
26295 SCSI Terminator, 50pin M/F Daisy-Chain $18
26296 SCSI Terminator, 50pin male $18
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23832 External Tape Back-Up 5040/60 $635
23833 External Tape Back-Up 5080/120 $795
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26900 Keyboard Replacement Cable, 3ft $24
26897 LaserWriter II Dust Cover $12
26899 Mac II Monitor Extended Kit $32
25580 Mac II Monitor Stand $62
26892 Mac II Stand and Cable Kit $63
26887 Mac II System Stand $20
26893 Masterpiece Mac II $103
26882 SE Anti-Glare Filter (beige) $32
26883 SE Anti-Glare Filter (platinum) $32
26884 Security Kit $33
26888 System Saver Plus (beige) $62
26907 System Saver Plus (platinum) $62
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25582 Tilt/Swivel $24
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41601 Teak 3.5" Double Rolltop Box (90) $29
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Summagraphics
26885 Bit Pad Plus $318
Tripplite
40510 SpikeBar SK6-6 $22

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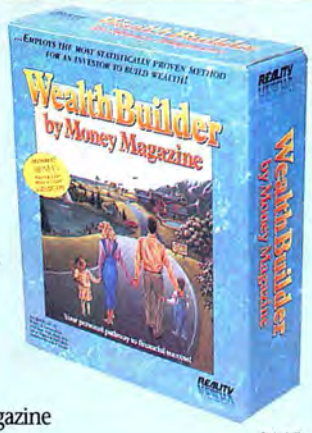
Farallon Computing
26886 Hyperdialer $32
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WealthBuilder by *Money* magazine
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30365 Mac Tools Deluxe $79
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30404 FastBack 2.1 $116
30405 FastBack 2.5 $118
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30420 Complete Undelete v1.0 $48
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30436 Norton Util for the Mac $79
30340 Sum II v2.0 $98

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30426 101 Scripts & Buttons $35
Software Innovations
30510 HandOff II $51

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Fifth Generation
30399 Pyro 4.0 $25
Ibis Software
30538 Protector Shark $31

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30414 Virex (10 Pack) $346
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30342 SAM v2.0 $63

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30402 Suitcase II 1.2.3 $47
Insight Development
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TelePort Modem (Global Village).
22311 $134

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DO-IT-YOURSELF Screen Tests

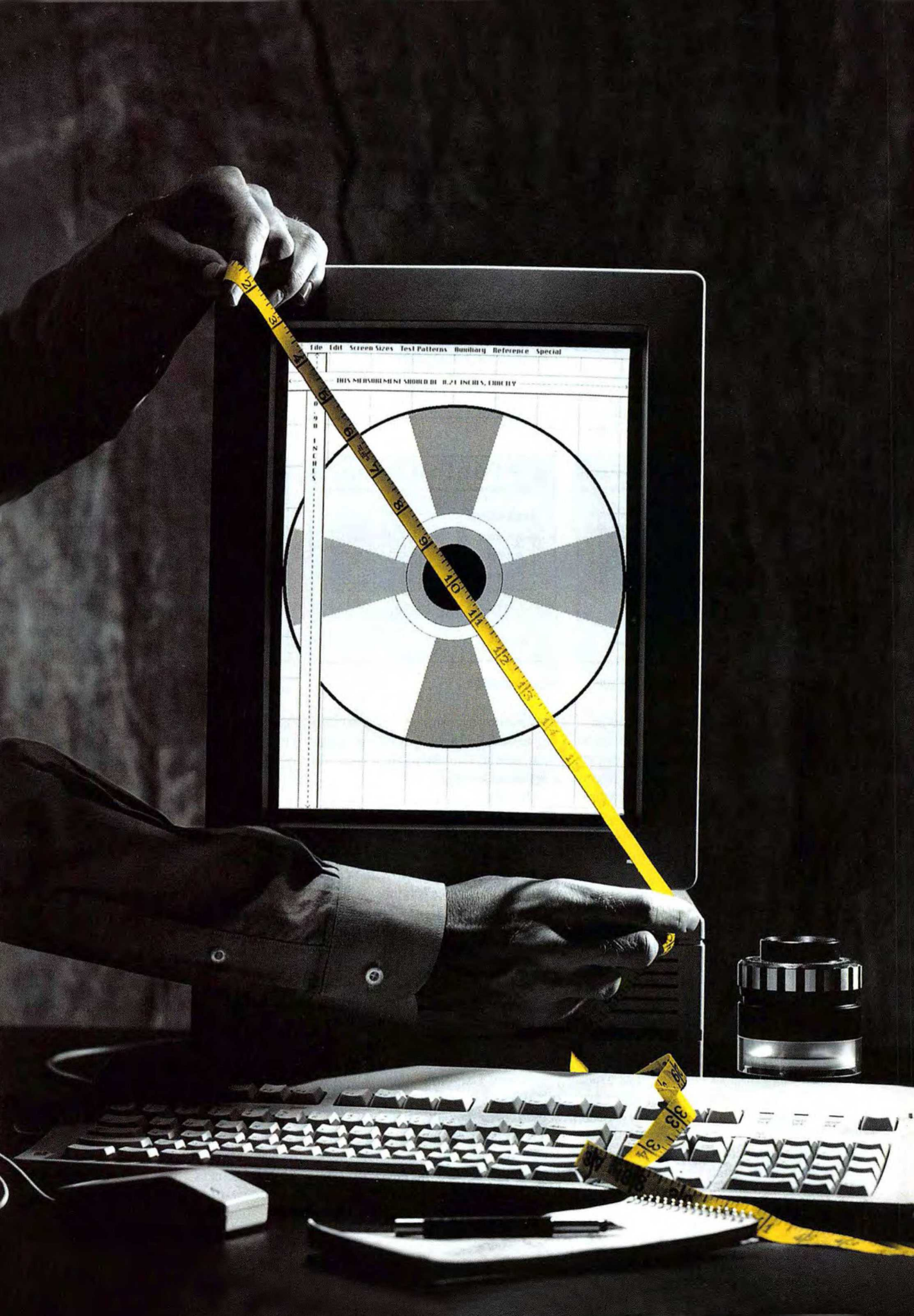
MacUser Labs reveals its monitor-shopping secrets: what to bring, what to look for — even what to wear!

BY KELLI WISETH, PAUL YI, AND THE MACUSER LABS STAFF

It's like a bad dream. You're alone with a salesman and a bank of full-page displays staring you in the face. He's wearing a pressed white shirt with a yellow power tie and is throwing out raster and phosphor jargon left and right. You juggle features and prices in your head. But all the displays look the same, and he's demanding a decision. You stutter, close your eyes, and find yourself sinking into a pool of sweat.

Don't let this happen to you. The next time you go to a computer store, take MacUser Labs with you. Arm yourself with five of our monitor tests that will help you judge a monitor's focus; geometry; and nuisance factors such as flicker, jitter, and glare. Our tests are designed to alert you to deficiencies in any monitor, be it a full- or two-page display, monochrome, gray-scale, or even color. We've narrowed down the display choices for you in this month's full-page display lab report, and in previous reviews of the whole range of

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File Edit Screen Sizes Test Patterns Auxiliary Reference Special

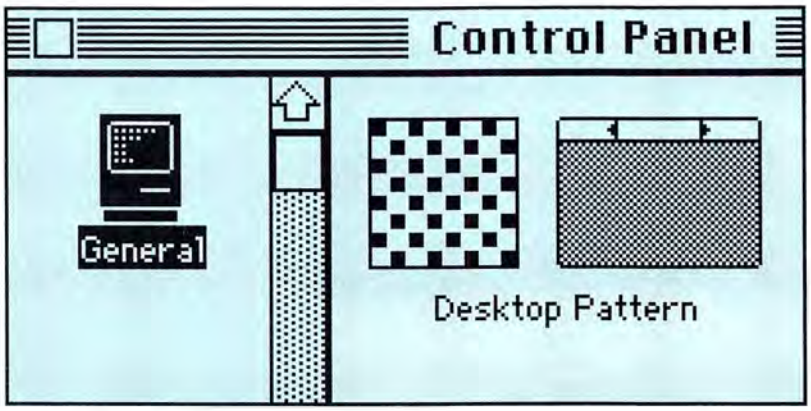
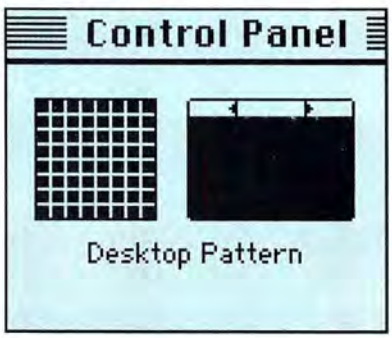
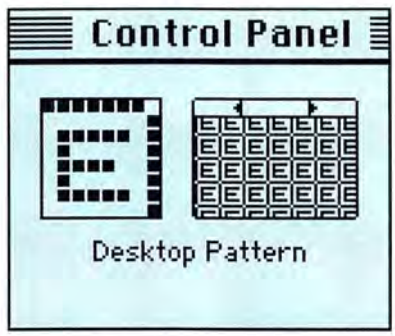


Figure 1: By simply changing the desktop pattern, you can test a monitor's focus and flicker. You can also set a monitor's maximum usable brightness. Open the Control Panel, and select the General icon. Change the desktop pattern to the one that's suited for the test you want to run, click on the example area next to the edit area, and then conduct the next visual test.

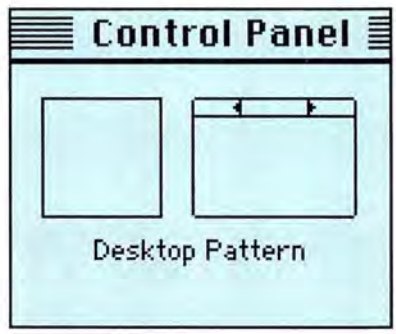
General Control Panel icon



Maximum-usable-brightness test pattern



Focus test pattern



Flicker test pattern

monitor types and styles. Now it's time for your personal preference to help you make the final call. So put on your own white shirt or blouse (more on this later); get a cloth tape measure, a notepad, and some shareware from Zmac; and tell the salesman that *MacUser* sent you. The power tie is optional.

The Tests

Have your dealer start up the three or four displays you're interested in. Make sure the monitors are not too close to each other, or their magnetic fields will interfere with each other. (If this isn't possible, turn the other monitors off while testing each monitor.) Also, ask your salesman to point the monitors either east or west. If he balks at this, remind him that monitors are set up and adjusted at the factory while facing east, to align them with the earth's magnetic field. A monitor facing north or south displays an image that is tilted slightly by the same force that points a compass. You've just impressed the heck out of the salesman, and he'll probably treat you with a bit more respect.

After the monitors are properly oriented, turn them on — and wait. A monitor should be on for a full 15 minutes to give the tube sufficient time to warm up (see the "How It Works: Displaying Images" sidebar). While you're waiting, let's review your test equipment: Your white shirt or blouse is actually to help test for glare — no savvy salesman would wear white, because its bright reflection on the screen shows each monitor at its worst. Your cloth tape measure will help you determine the monitor's actual resolution versus the manufacturer's claimed resolution. Use cloth tape instead of metal, because metal can scratch the screen — especially delicate OCLI glare-treated screens — and also affect a monitor's magnetic fields. Use the notepad to calculate resolution and keep track of all your comments. The shareware — Larry Pina's Color Test Pattern Generator — is to help you test each monitor's image quality.

Focus and Geometry

Now that the monitors are warmed up, set the optimal values for brightness and contrast — the *maximum usable brightness* — on each unit. Open the Control Panel and change the desktop pattern to solid black (see Figure 1). With all windows on the desktop closed, turn the monitor's brightness-control knob to increase the brightness until the black background can be barely seen, and then lower the brightness until the background is no longer visible. Look at the Apple's stem in the menu bar, and adjust the contrast control until the display begins to lose its sharpness; then turn the knob the other way until the sharpness just begins to return to the screen. The monitor is now adjusted for the maximum usable brightness.

The first test is for *focus*, because

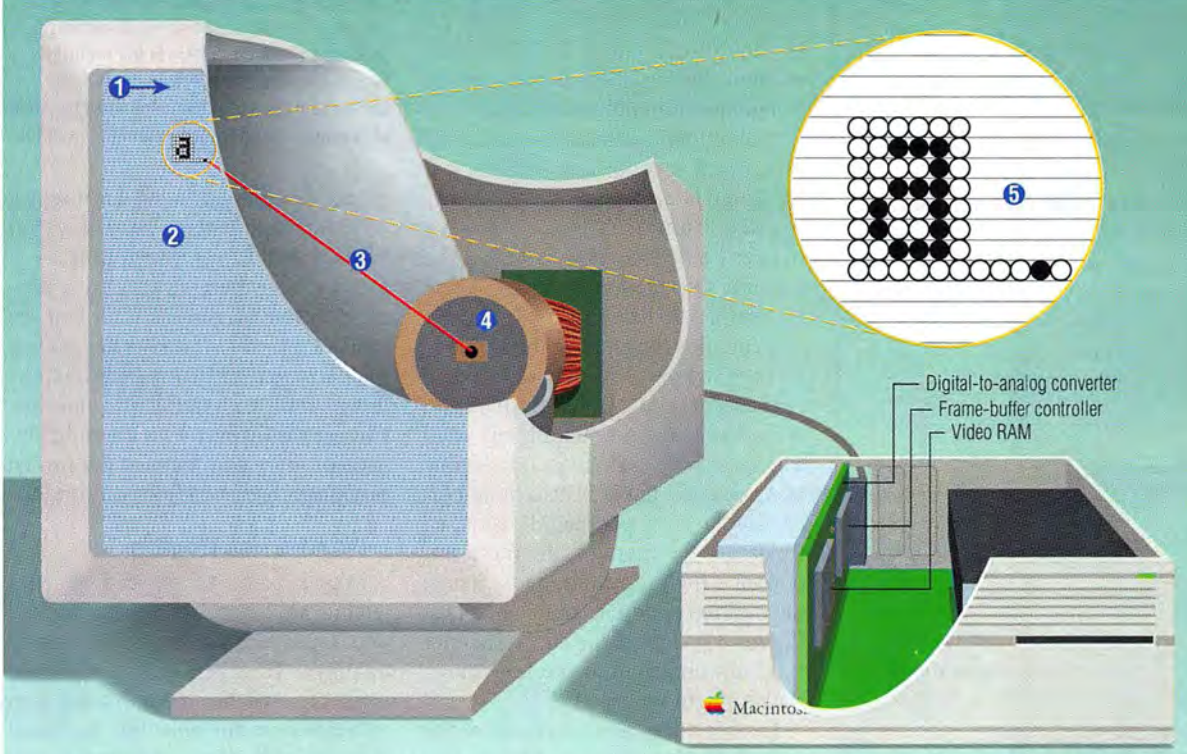
good focus is crucial for viewing text on-screen. The last thing you want is to strain your eyes to figure out if you just typed an *o* or a *c*. Here's an easy way to check focus: Change the desktop to a pattern of *E*s. Open the Control Panel and alter the desktop pattern so that an *E* comprises most of the area, bordered by two black lines (see Figure 1). Click within the example area to set the pattern, and then close all the windows on your screen so that only the desktop pattern shows.

Any blurring at the edges of the monitor will show up during this test. A monitor with excellent focus shows every pixel across the entire screen; monitors with poor focus have screen areas that are simply unreadable. No monitor has absolutely perfect focus, because the electron beam has to travel farther at the edges than at the center —there will always be some distortion.

Next test the monitor's *geometry*. Your test kit includes Larry Pina's Color Test Pattern Generator, which you've downloaded from Zmac, the on-line service for *MacUser* and *MacWEEK*. Pina's excellent test program is also available from several other sources, including user groups, on-line services, and commercial public-domain distributors (see "33 Unsung Shareware Programs," October '90, page 244). CompuServe subscribers can access Zmac by issuing a GO ZMAC command at any ! prompt. If you didn't bring The Test Pattern Generator with you, introduce your salesman to Zmac and have him pay the minimal download charges.

Launch the Test Pattern Generator,

How It Works: Displaying Images



1. To create a screen image, an electron beam starts at the top left corner of the screen and scans horizontally across the screen from left to right. When the beam completes a line, it flicks back invisibly to the left edge and down one pixel to the beginning of the next line. Because of its rakelike effect, this technique is called *raster scanning*— *raster* is the Latin word for *rake*.

2. When the beam reaches the bottom of the picture, it flicks back to the beginning of the top line and repeats the process. This entire process repeats 65 to 75 times — or cycles — per second (hertz). Any rate higher than 60 hertz is usually acceptable.

3. The inside of the tube's face is coated with one of many different types of *phosphor*, a substance that glows after an electron beam strikes it. If the phosphor coating is fine and the beam is closely focused, a very tiny, brilliant dot is created. The phosphor's *decay time* — how long it remains glowing — determines how long it will be visible on the face of the tube. If the image decays before it is refreshed, you can see flicker.

4. The yoke assembly houses electromagnets that deflect the electron beam. Telephone handsets, motors, stereo speakers, and even steel office furniture are sources of magnetic fields and can cause poor geometry.

5. The electron beam turns on and off to create black or white pixels as it scans. The beam is more diffused as it reaches the edges of the monitor, which means the edges tend to be out of focus.

and hold the mouse button down to get past the startup screen. The first thing you want to do is set the screen size for the program by selecting the Unlisted Mac Monitors option from the menu (see Figure 2). Jot down the screen width and height in pixels before clicking on OK. To compute the monitor's actual resolution in dpi (dots per inch), divide the vertical (screen height) and horizontal (screen width) pixel dimensions by the actual vertical and horizontal dimensions that you measure with your cloth tape measure. Both results should be the same, and both should equal the dpi rating advertised by the manufacturer. Remember, 72 dpi is the only true WYSIWYG resolution.

Next hold down the Option key and choose Balance Test from the Test Patterns menu. The screen will fill with a test pattern comprising a large circle in the center and four small circles, one in each corner (see Figure 3). Scrutinize each circle carefully; the pattern will reveal any geometry problems in the monitor. Look for flattened and elongated circles. The Test Pattern Generator also includes other screen images that are useful in evaluating geometry — play around with it to discover images that are useful to you.

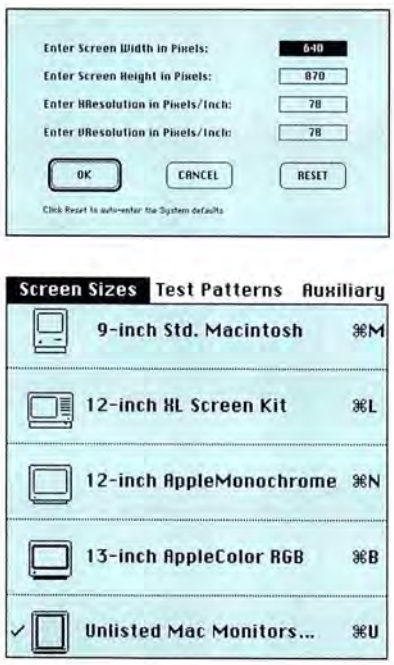


Figure 2: Larry Pina's shareware program Color Test Pattern Generator includes a variety of test screens, and it helps you compute the actual resolution of a display. Selecting the Unlisted Mac Monitors option on the Screen Sizes menu gives you the dialog box for the monitor's resolution and pixel dimensions.

Flicker, Jitter, and Glare

The next set of tests reveals the monitors' *nuisance factors:* flicker, jitter, and glare. Flicker makes the monitor behave like a strobe light. Jitter makes text and lines look very "nervous." Glare is the on-screen reflection of everything in front of the monitor. Each of these irritants can be tested in a straightforward way.

A monitor refreshes its screen many times each second; this frequency is measured in cycles per second or hertz (see the "How It Works: Displaying Images" sidebar). This is called the monitor's *vertical refresh rate.* A rate higher than 60 hertz is usually acceptable, but this depends on the sensitivity of your eyes. If you're sensitive to fluorescent lights, which flash on and off at 120 hertz, you'll probably want a monitor with the highest refresh rate you can get. Flicker is also more perceptible in your peripheral vision, so the larger the monitor, the more important a high refresh rate is. Change the desktop pattern to pure white (see Figure 1), step back, and turn your head left and right to see how much flicker the monitor has.

Jitter is very fast movement of the screen display. Text and lines will appear very excited. Jitter can be caused by external interference such as vibration of a hard drive, excess movement of the desk, or even the nervous twitch of the user's legs. Jitter can also be caused by a faulty amplifier in the monitor. If one display has more jitter than the others, there's probably something mechanically faulty inside. Choose another display.

Glare is the result of a trade-off between brightness, focus, and the lack of glare treatments. The white shirt helps with this test. Stand in front of the monitor when it's set at its maximum usable brightness. Can you see yourself clearly? If not, is the display too fuzzy to read? Turn the brightness down until your reflection appears. Choose the display with the right balance of glare and focus at the lowest brightness level you find comfortable.



Figure 3: This test pattern — as shown by the Apple Portrait Display — will help you assess a monitor's geometry. Geometry problems show up mostly at the monitor's edges, because the electron beam has farther to go to reach the edges and because of magnetic interference within the monitor.

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We've come to the end of your testing adventure. Never again will you be at a loss for opinion in judging displays. Between your subjective impression of the monitors that you examine and our objective technical overviews of all the monitors on the market, you're sure to make the right choice. We'll keep our MTF (modulation-transfer function) testing equipment busy, you keep that white shirt ironed, and you'll always be able to make the final buying decision with confidence.

Kelli Wiseth and Paul Yi are associate editors at *MacUser*, neither of whom would ever wear an ironed shirt or a power tie.



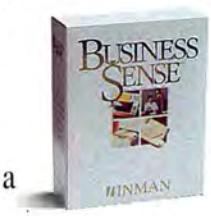
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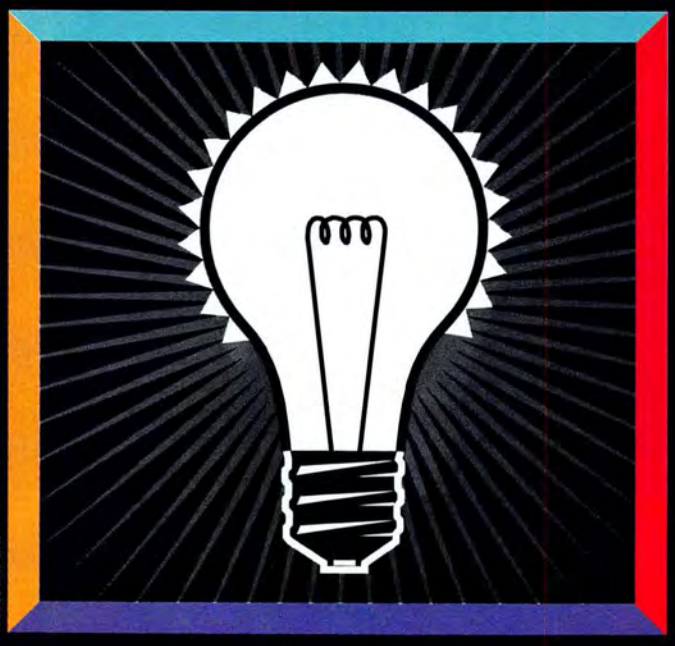
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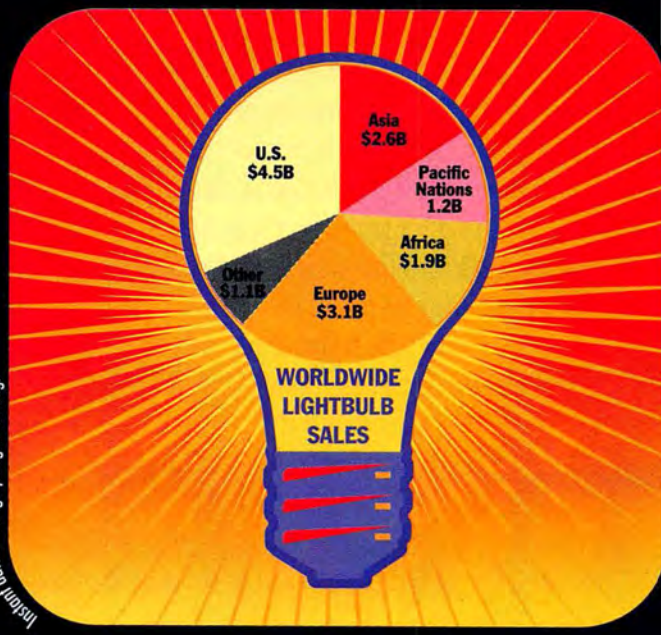
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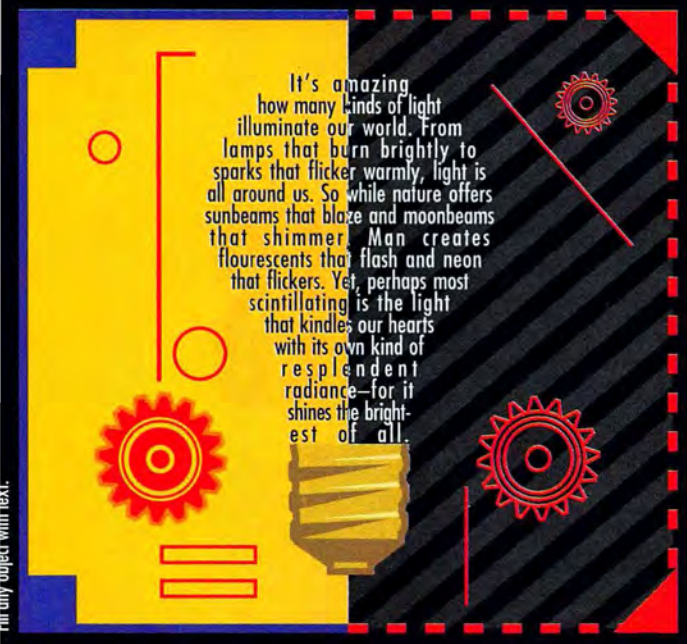


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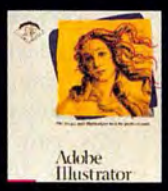
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PORTABLE SECURE UNLIMITED-STORAGE CARTRIDGE DRIVES

Three technologies, thirty drives — which cartridge drive is right for you? MacUser Labs tests them all, and the winner is

BY STEVE COSTA AND THE MACUSER LABS STAFF

Do you constantly fill up your Mac's hard-disk drive? Have you been dreading making that eventual choice between getting an even larger hard drive or shelving ever-larger chunks of your wonderful software collection? Do you hate dragging around a big, clunky hard drive? Is your traveling floppy-disk collection getting damaged and lost? Or do you simply need a way to lock up confidential data when you're not around?

If you answer yes to any of these questions, then you probably need a magnetic-disk-cartridge drive. That's the easy part. You have three types of internal mechanisms to choose from: Bernoulli flexible-disk-cartridge systems manufactured by Iomega and two different hard-disk-cartridge systems manufactured by SyQuest and Ricoh.

Which is best for you? Storage capacity isn't a major factor: All three systems provide 40 to 50 megabytes of removable, transportable storage per cartridge. To complicate matters further, 30 vendors couple these systems with power supplies, put them into cases with the necessary SCSI connectors and switches, add software, and sell them under a variety of brand names. Each system is intended to be (knock on wood) compatible with all drives that use the same manufacturer's cartridges — any SyQuest cartridge should work in any SyQuest-based drive, for example; however, a SyQuest cartridge will not fit a Bernoulli- or

PHOTOGRAPHY: FRED STIMSON


44
WRITE PROTECT
BERNOULLI
MICROTECH

Ricoh-based drive, and vice versa.

All three approaches fit a limited budget and can satisfy your expanding need for disk storage. The three cartridge types are lightweight and compact, and all make moving large amounts of information from one place to another less cumbersome and less expensive.

So which should you choose? Whose advertising claims should you believe? Or should you pick a different storage technology entirely (see the "Other Removable Media" sidebar)? Come with MacUser Labs as we explore the hidden differences among magnetic-disk-cartridge drives.

Round, Removable, and Magnetic

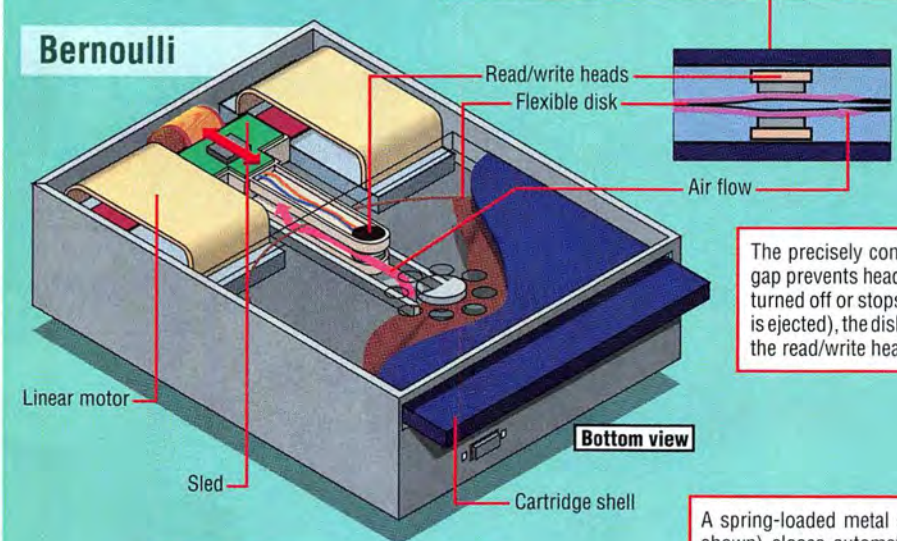
Of the 30 drives we tested that use one of the three magnetic-disk-cartridge systems, 2 — the Iomega Transportable 44 and the Ocean Microsystems Totem IV 44MB — use Iomega's Bernoulli system. Twenty-four — from the Alliance Peripheral Systems 45 MB Removable through the Total Peripherals TP-44R — use the popular and time-tested SyQuest hard-disk-cartridge system. The remaining 4 — the Corel Systems 50 MB Removable, Microtech International R50, Sumo Systems SSER 50 Removable, and Univation Q50 — use the new hard-disk-cartridge system from Ricoh.

The Bernoulli system, introduced to the Macintosh market in 1985 and refined during following years, was

How It Works

Bernoulli, SyQuest, and Ricoh drives use three types of impact-resistant plastic cartridges, each containing a disk with a capacity of 40 to 50 megabytes. Bernoulli technology uses flexible media, whereas SyQuest and Ricoh employ highly polished aluminum disks plated with a magnetically sensitive metal alloy. When a cartridge is inserted into a drive, the disk's metal hub is held and rotated by a motor-driven spindle (in SyQuest and Ricoh mechanisms, the spindle is magnetized). The cartridge's access door or shutter is held open while the read/write heads are inserted and brought close to the disk surface. A write-protect switch on the cartridge can be set to allow reading of the disk while preventing accidental erasure of data.

Bernoulli drives take advantage of an aerodynamic phenomenon called the Bernoulli effect. As the flexible, two-layer plastic disk spins, air moves outward over both sides of the disk; as the air passes quickly between the disk surface and the drive's read/write heads, the air pressure is reduced in those two narrow gaps. As a result, small areas on both sides of the disk are pulled almost into contact with the read/write heads.



The precisely controlled air pressure in the read/write gap prevents head crashes. When the Bernoulli drive is turned off or stops spinning the disk (before a cartridge is ejected), the disk surface is no longer pulled up toward the read/write head.

A spring-loaded metal shutter (not shown) closes automatically when the cartridge is ejected.

A solenoid-activated metal pin (not shown) locks the cartridge in place until its disk has stopped spinning.

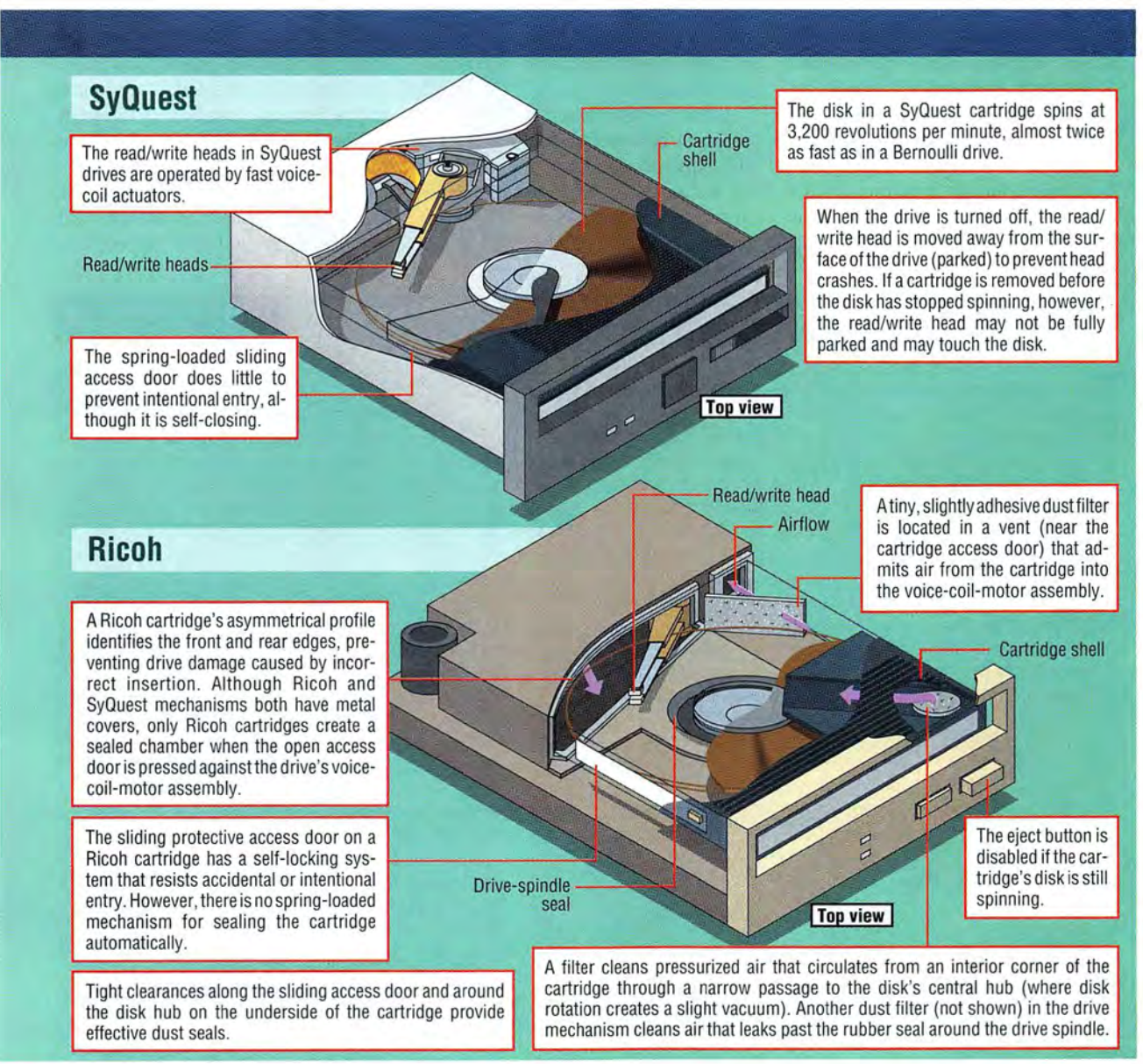
one of the first widely distributed systems to use high-capacity flexible-disk cartridges. The Bernoulli cartridge looks pretty much like a standard Mac floppy disk, scaled up to contain its 5.25-inch-diameter medium.

As a Bernoulli disk spins, first centrifugal force and then changes in air pressure lift the surface of the plastic disk close to the drive's magnetic read/write head. Unlike with fixed hard disks, removable hard-disk cartridges, or conventional high-capacity floppy disks (such as "megafloppies" from Kodak/Verbatim and Data Technology), a carefully controlled aerodynamic effect makes the Bernoulli-disk surface virtually immune to read/write-head crashes (see the "How It Works" sidebar).

The Bernoulli effect, named after Swiss physicist Daniel Bernoulli (1700 – 1782), is observed when the velocity of a fluid, such as air, increases over a surface and the pressure on that surface then decreases. (If you have any doubt that the Bernoulli effect can be safely controlled in practice, you should avoid flying in airplanes.)

Even when the Bernoulli drive is turned off, contact between the read/write head and the disk is next to impossible. Nevertheless, although Bernoulli drives have evolved over the years, they still tend to be heavier, slower, and louder than hard-disk-cartridge drives.

SyQuest hard-disk-cartridge drives for IBM-compatible PCs appeared in



1983 but took five more years to make it to the Mac. The outside appearance of SyQuest hard-disk cartridges suggests thicker, rather simplified versions of their Bernoulli counterparts. On the inside, however, the two cartridge systems are completely different. The SyQuest medium is a hard, magnetically coated metal platter, somewhat thicker than that used in any fixed-hard-disk drive. In operation, both the SyQuest and the Ricoh mechanisms and cartridges are very similar to a conventional hard drive — except that the cartridges can be removed, leaving behind the read/write heads and all other drive components.

Although the new Ricoh drives outwardly resemble the established SyQuest drives, we found noticeable advantages in Ricoh's cartridge design: more durable construction, better dust protection, and more sophisticated safety features in operation (see the "How It Works" sidebar). Even so, it may be too soon for Ricoh to boast, without unbiased proof, that its drives are significantly more reliable; Ricoh cartridges aren't common enough and haven't yet accumulated enough dusty, real-world mileage to support such a claim.

At press time, SyQuest and Microtech International (formerly a major SyQuest vendor and now the largest distributor of Ricoh-cartridge drives) were engaged in well-publicized lawsuits, with Microtech claiming high failure rates for the SyQuest drives and SyQuest charging Microtech with violations of contractual arrangements.

Initially Microtech submitted a SyQuest-based drive for our tests but subsequently withdrew it, leaving just its Ricoh drive. (The company has instituted a 24-hour service-and-repair program for all SyQuest drives still covered under its five-year warranty.) In this friendly atmosphere (and with other new Ricoh distributors such as GCC Technologies casting doubt on SyQuest-drive reliability), MacUser Labs began testing the latest Ricoh, SyQuest, and Bernoulli drives.

What Makes a Good Drive?

Because every removable drive starts out as a standard mechanism from the OEM, many consumers believe that the final products are virtually identical. But by the time each distributor has decided on a power supply, internal framework, SCSI connectors, formatting and driver software, and so on, the finished drives' reliability, features, and performance can be very different.

The first indications of a good magnetic-disk-cartridge drive are a substantial power supply that has UL (Underwriters' Laboratories) approval; a quiet fan; a metal case; and easy-to-

Other Removable-Media Drives

Magnetic-disk-cartridge drives aren't the only devices that use removable media. Several other options have mechanisms based on magnetic and optical technologies (see Table 1).

Erasable optical drives, which can both read and write data, are the mass-storage heavyweights (along with DAT and 8-millimeter tape drives). Their 5.25-inch cartridges can hold up to 1 gigabyte (1,000 megabytes), although approximately 300 megabytes per side is the prevailing standard (see "Erasable Optical Drives," November '90, page 102). New 3.5-inch cartridge drives hold up to 128 megabytes.

Erasable optical drives are generally heavier and somewhat slower than magnetic-hard-disk drives, and their cases are larger to enclose power supplies, laser mechanisms, and fans. Erasable optical technology provides excellent data stability and — at high capacities — can offer the best ratio of rewritable storage capacity to cost (see "Megabytes per Buck," November '90, page 105). Erasable optical drives are getting cheaper and faster, and their standard data formats now allow cartridges to be used in different vendors' drives. The main problem remains initial expense; the drives cost between $3,000 and $8,000, and cartridges can run more than $200 each.

WORM (write-once, read-many) optical drives seemed pretty impressive only a few years ago. Then erasable optical technology became affordable so quickly that single-purpose WORM drives never did well outside vertical markets in which WORM is used primarily for ultrasecure archiving. WORM is slow, but it offers a data stability conservatively estimated at 100 years. Soon, however, "multifunction" drives combining WORM and erasable optical technology may begin to dominate this market.

Removable hard-disk subsystems consist of a standard hard-disk system in a compact, airtight, portable case, separated from the power supply and many electronic components in a stationary chassis — an excellent option if you want the speed of magnetic media. Each removable subsystem contains its own sealed, individually aligned read/write heads, which adds weight and expense yet considerably improves reliability. Hard-disk subsystems are used primarily where maximum speed, reliability, and security are needed, but their higher cost makes them a rare sight. Some hard-disk subsystems, including the Tranzpak3 (Z Microsystems, Carlsbad, California) and several from Mega Drive Systems (Los Angeles, California), combine high speed and large capacities with surprisingly competitive prices.

High-capacity floppy-disk (megafloppy) drives are also available without the fast, high-density Bernoulli technology. Like Bernoulli cartridges, megafloppies resemble standard Mac floppies, scaled up to hold 20 megabytes on a 5.25-inch medium. They have tended to be slow and not always reliable. High-capacity-magnetic-floppy technology from Kodak/Verbatim and Data Technology gave 44-megabyte hard-disk-cartridge drives a run for their money a few years back, but megafloppies weren't cheap or reliable enough to compete with low-priced, higher-capacity SyQuest drives or with fast Bernoulli drives. However, recent developments in the production of flexible magnetic media (coated with barium ferrite) have produced 3.5-inch floppies that can hold up to 25 megabytes. Stay tuned for further developments.

Tape-cartridge/cassette drives offer very large capacities and excellent reliability (see "Getting It on Tape," December '89, page 189). The cartridges are very practical for transporting large amounts of data, but the receiving user must have a drive that uses the same data format (the variety of tape standards is much greater than the variety of magnetic-disk cartridges) and must also have plenty of time for waiting as the tape slowly unwinds.

use, all-purpose formatting software and utilities. Other important features include shielded SCSI connectors (preferably standard 50-pin) and external SCSI termination; good technical support from the distributor or an authorized service center plus a long warranty; and a well-written and up-to-date manual. Finally, smart users — to protect against careless product engineering — come in handy.

An example of how easily product engineers can ignore average Mac users' normal work habits: The cases on some cartridge drives are flexible enough that if you put something even moderately heavy (such as a Mac SE) on top of the drive, the case can distort enough to obstruct the fan, or generate a rattling noise, or even damage the delicate electronics. Squeeze each candidate before you buy.

Oddly enough, there doesn't seem to be a direct correlation between a magnetic-disk-cartridge drive's quality and its cost. The FWB and PLI drives are well built and have high list prices, whereas other drives offering good component quality — such as the MacProducts USA Magic 45 and the Ehman 45 MB Removable — are much more reasonably priced.

According to SyQuest, cheap power supplies emit radio-frequency noise that can interfere with data throughput in the drive's controller board. Because this phenomenon is almost impossible for users to test in advance, the only protection is the longest possible warranty from a reputable vendor. This isn't a problem for drives with a well-designed, shielded internal metal frame (which keeps radio-frequency noise from interfering with data throughput). Our examination of the drives for this report uncovered a broad range of shielding quality: Among the drives with the best shielding was the excellent MicroNet MR45.

But shielding of this sort can also have a negative side — if it isn't positioned correctly. Poorly placed electromagnetic shielding can block air flow to the controller board, causing rapid heat buildup. Over time, high temperature can cause electronic components to fail prematurely; the warmer a drive, the sooner its demise.

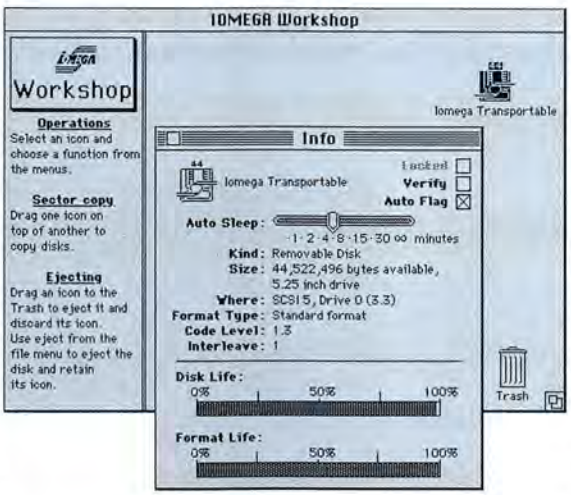


Figure 1: Iomega's Workshop software uses the Transportable 44's Info dialog box to track both remaining format life and remaining disk life — that is, how much space is left on the disk and how long the disk is expected to last. Also provided is an Auto Sleep control that determines how long disks should remain spinning without the drive's receiving read or write commands from the Mac.

One easy way to tell if a drive is too hot is to feel a cartridge after a few hours' use; if the cartridge is truly hot (not just warm) to the touch, the drive mechanism may fail earlier than that of a similar drive with better ventilation. Heat buildup can be a real problem with SyQuest drives.

On the other hand, be forewarned that some cheap disk-cartridge drives come with fans loud enough to frighten off nearby trucks. We found no unreasonably loud fans among the drives we tested, but hardware specs are always changing; any drive that's still under warranty and develops an annoying whine, buzz, or rattle should go back to the dealer.

Growing Pains

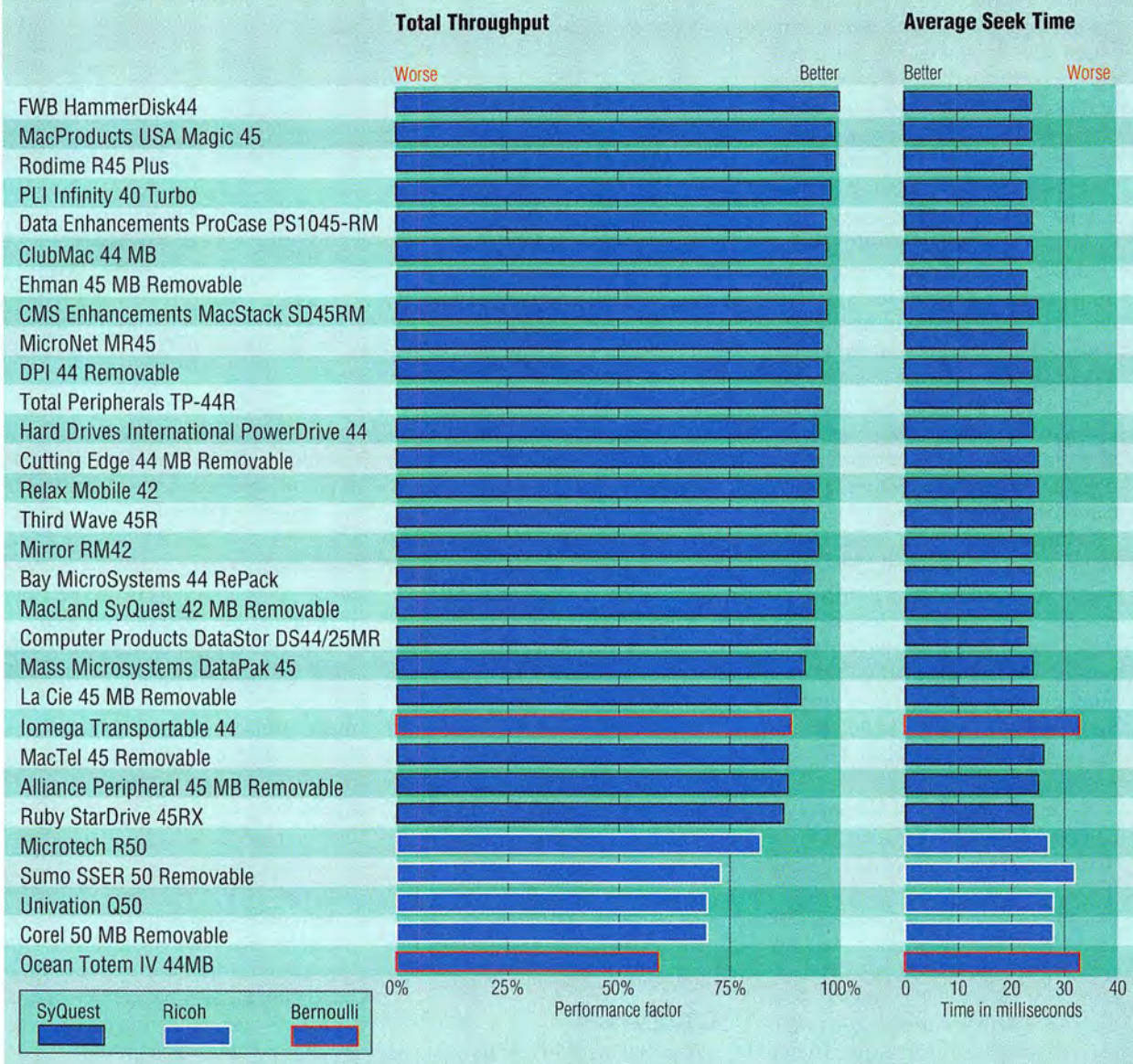
When SyQuest drives first became available for the Mac, they had major problems with power-supply failure (which wasn't actually part of the SyQuest mechanism) and with cartridges jamming in the drive. If you didn't eject cartridges carefully, you could rip the delicate read/write head right out of the drive.

If a cartridge ever jams in an older SyQuest drive, here's the recommended solution: Push hard against the top center edge of the cartridge while simultaneously pushing the eject lever. This will usually release a jammed cartridge; the only other option is to have your dealer disassemble the drive. SyQuest claims that cartridge jams should not be a problem with the newer (revision 7 or later) drives; if a jam occurs in one of these new drives, get the drive replaced.

Unfortunately, it is still possible to stick a SyQuest cartridge backward into its drive — don't laugh, we can all make mistakes when we're in a hurry. If done with enough force, this can definitely damage the drive. According to SyQuest, user education is the only immediate solution to this problem (until vendors come up with a hardware fix).

Bernoulli technology still has a few problems that have lingered from its first days in the Mac market. Most important, the flexible medium in the cartridges can and does wear out, depending on how much the disk is kept spinning in the drive (and therefore flexing under the read/write head). Bernoulli drives also need regular internal cleaning (special kits are provided for this purpose), or read/write errors can occur. The cartridges do come with a five-year warranty, however — as opposed to the far more common one-year warranty for SyQuest and Ricoh cartridges. Iomega's excellent Workshop software (see Figure 1) minimizes and keeps track of media wear. And Bernoulli

Figure 2: Performance of Magnetic-Disk-Cartridge Drives



Total Throughput

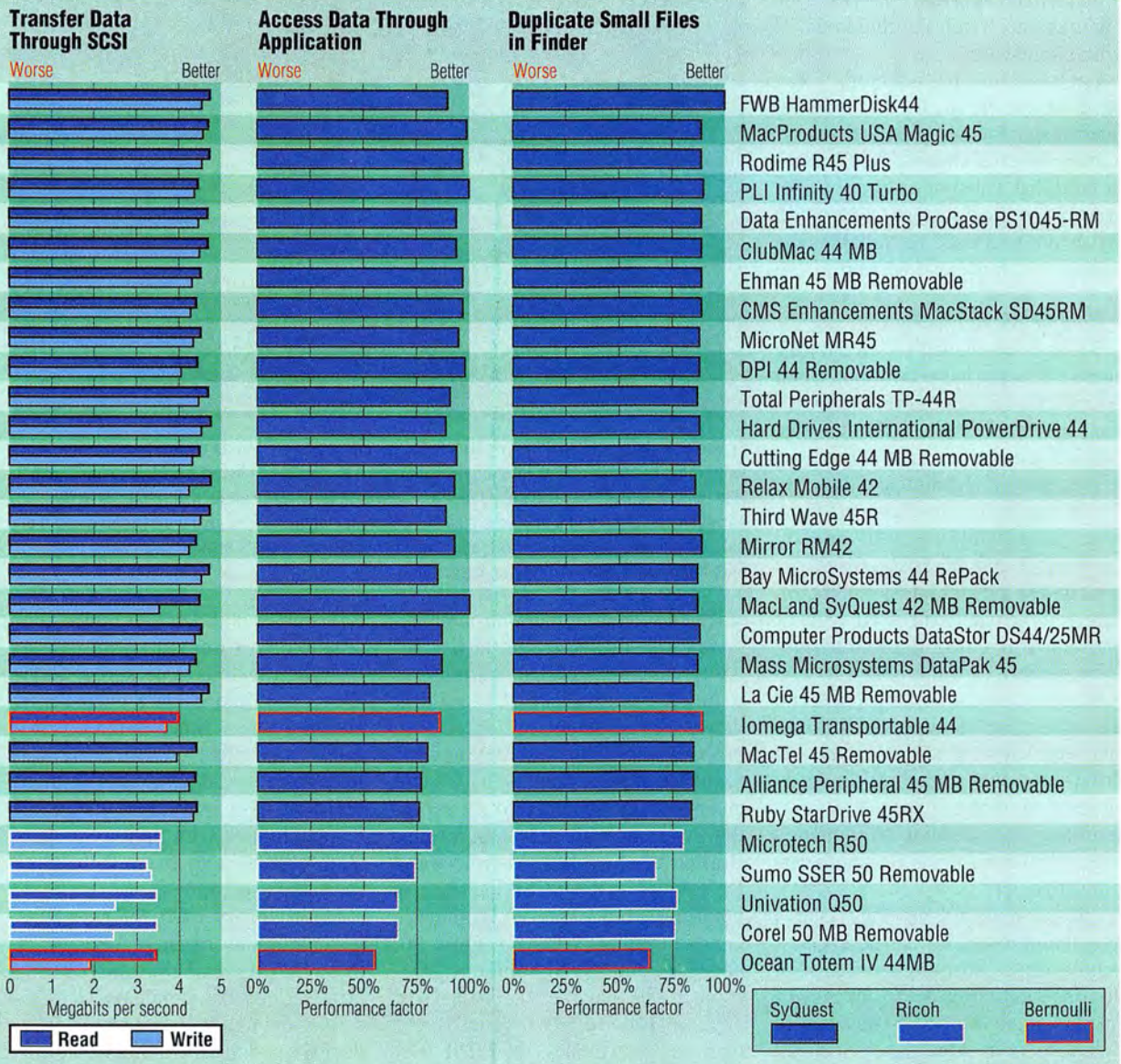
Throughput — how fast a drive can get data into and out of your Mac — is the most important measure of a cartridge drive's performance, especially when average seek times are nearly identical. Total throughput is a composite score of each drive's performance on all tests except average seek time — the same ranking is used for all charts. This chart shows how quickly each drive could transfer data when compared with the fastest cartridge drive, which was the FWB HammerDisk44.

Average Seek Time

We used SCSI Evaluator to determine each drive's seek time — the average time required for the read/write heads to move from one track to another on the disk's recording surface. In theory, the lower the average seek time, the faster the drive. However, most of these drives have seek times of 23 to 25 milliseconds (thousandths of a second), not enough difference to significantly affect performance. Because SCSI Evaluator does not work with Bernoulli-based drives, we used seek times provided by Iomega (the manufacturer of the Bernoulli mechanism) to evaluate the Iomega and Ocean drives.

Transfer Data Through SCSI

We used SCSI Evaluator to separate the read and write data-transfer rates when transferring data via the SCSI interface. All SyQuest drives showed fairly similar results, with Ricoh and Bernoulli drives proving



somewhat slower. The Ocean Microsystems Totem IV 44MB delivered the longest write times, but Ocean software currently uses a driver that *always* verifies data after it's written to disk — keep that in mind before faulting this drive's lower speed (Ocean is working on a faster version).

Access Data Through Application

Our DiskBasher! benchmark simulates the way an application writes and reads 10 megabytes of medium-sized files (such as those on a typical hard disk). This test and the following Finder duplication test are not measures of raw throughput but simulate actual use. The chart compares each drive's performance with that of the fastest drive, the MacLand SyQuest 42 MB Removable. Despite its low speed when transferring raw data via SCSI, MacLand's drive delivered the shortest combined read/write times with DiskBasher!. The Bernoulli-based Iomega Transportable 44 beat all four Ricoh drives and even some of the SyQuest mechanisms as well.

Duplicate Small Files in Finder

Using the Finder's Duplicate command, we measured how quickly each drive could copy a 10-megabyte folder containing mostly small files. We again compared each drive's performance with that of the fastest drive, which in this case was the overall winner, the FWB HammerDisk44. This test confirmed that although all SyQuest mechanisms are created equal, good driver software (as with the FWB HammerDisk44) still saves precious seconds.

distributors typically are very fast about replacing a failed cartridge; a replacement is often shipped (via overnight air freight) within hours of your phone call.

Let us add a final warning: If you need removable media that will frequently spin for hours and even days at a time, stick with hard-disk cartridges or hard-disk subsystems (or consider erasable optical drives). Bernoulli drives are best used for reliable data transport, storage, and backup.

New Kid on the Block

Ricoh drives haven't been out long enough for us to judge how much their operation has benefited from SyQuest's long history. It's clear, though, that Ricoh learned from a common cause of SyQuest-drive failures: damage to the read/write heads when cartridges were ejected while the disks were still spinning. Ricoh drives simply cannot eject unless the disk has stopped spinning and the read/write head is out of the way. Still, unlike Bernoulli drives (which eject a cartridge only if its icon is dragged into the desktop Trash and the drive spins down), Ricoh drives can eject cartridges even when the drive's power is turned off. In emergencies, of course, a special tool (resembling the familiar straightened paper clip) can force a Bernoulli cartridge to eject.

Ricoh mechanisms may take a longer time to spin up than do SyQuest or other drives, so trying to use a Ricoh drive as your startup device takes careful planning if other SCSI devices are linked to your Mac. Even with all SCSI-ID numbers correctly set, you have to turn on the Ricoh mechanism several seconds before you turn on your other SCSI devices, so that the Ricoh disk will be spinning at full speed when the Macintosh checks the SCSI chain for available startup drives. Both GCC Technologies (see the "Late Arrivals" sidebar) and Microtech have software solutions to this complication.

Another problem recalls the compatibility hassles that SyQuest drives suffered soon after their introduction. At times it's difficult to get the (Ricoh-based) Microtech and Univation drives to function with other SCSI hard-disk drives. Even when all drives are properly terminated, sometimes the sequence of SCSI devices in the cable chain must be switched to get everything working without system crashes. But don't rush to blame Microtech and Univation — the SCSI interface is notoriously fickle (see "A Beginner's Guide to Daisy Chains," August '90, page 243, and "SCSI Solutions," December '89, page 229). Prospective buyers of Ricoh drives may need more than basic awareness of SCSI IDs, cables, and terminators, however.



Figure 3: A SyQuest cartridge (right) has the simplest design, but its sliding access door is vulnerable to accidental or intentional entry and it's possible to insert a cartridge backward into the drive. Ricoh uses a subtly tapered cartridge (left) that can be inserted only in the correct orientation and employs a dust-resistant locking system to seal a cartridge when it is not in the drive. Bernoulli cartridges (center) vaguely resemble a scaled-up conventional Mac floppy with more durable construction.

Revisionist Hardware

There have been three generations of SyQuest drives over the past two years. The first two generations were fine; the drives performed adequately, but they left lots of room for improvement. The third generation tried to reduce disk-access times and to correct a few design flaws (such as the drives' willingness to eject cartridges while the disk was still spinning). Revisions 1 and 2 of these third-generation drives were marginally faster than the previous generations. Revisions 3, 4, and 5 were even faster, boasting access times in the low 20-millisecond range — respectable even for a fixed hard disk. However, these revisions also introduced major incompatibilities with various printers and scanners and even with some formatting software.

Until January 1990, SyQuest shipped thousands of these revision 3-through-5 drives before discovering how serious the problems were — serious enough to prompt a recall order to its various distributors. Unfortunately, the companies selling SyQuest drives had no legal obligation to inform users who had already purchased the problem drives. This became especially nasty, in that the only way to find a drive's revision number was to open the case and check the serial number, an intrusion that would invalidate the warranty!

There's now a freeware program called SCSI Probe (the latest version is available in *MacUser*'s Zmac Download Library Forum on CompuServe)

that can help you easily determine revision numbers without jeopardizing your warranty. SCSI Probe is a cdev that gives basic information about each of the SCSI devices connected to your Mac and displays the version number as a three-letter code.

If the version number of your drive contains the characters *F5E*, then the drive is part of the problematic revisions 3 and 4. Finding out if you have a revision-5 drive is more difficult, because it has the same three-letter code as revisions 6 through 10 — which *don't* have the compatibility problems. SyQuest states, however, that revision 5 drives were the last ones sold with an orange disk-activity indicator light. Unfortunately, SyQuest cannot promise that it will never use an orange light in future drives. If you do have an older SyQuest drive with an orange indicator light, the version code to worry about is *F2G*.

If you discover you have a faulty drive, return it directly to the company or dealer that sold you the drive and ask it to confirm the revision 5 designation. If this presents problems (or if the drive is no longer under warranty), then SyQuest suggests that you call its technical-support staff. The company's stated policy is to remove all remaining unsold defective older drives from the market. Any faulty drive already in use will qualify for a free upgrade if it's still under warranty (upgrades to out-of-warranty drives require a service charge). If you're shopping for a SyQuest drive, be forewarned that our quick survey of local computer stores discovered several revision 4 and 5 SyQuest mechanisms waiting for their first owners.

Further problems may arise if you use more than one brand of SyQuest drive. Not all the formatting software sold with these drives is compatible with other formatters. This is the result of Apple's having left the choice of SCSI-disk-driver software to third-party vendors. Because each formatter may have a slightly different driver, some drives may have problems with cartridges formatted by another company's software. These problems range from the inability to mount cartridges to corrupting the data on cartridges when they are inserted.

Although the companies selling these different drives probably wouldn't actively market this approach, it is a good idea for people who use multiple brands of SyQuest drives to standardize on a single formatter. This is the best way to ensure that each of the drives can read any of the cartridges without problems.

If you must use a cartridge that was

Care and Feeding of Your Cartridge

Now that you have your precious Mac files safely stored on a handful of sturdy, compact, interchangeable cartridges, let's consider how you can avoid trashing those cartridges.

Most importantly, before shutting down the Mac, always dismount a cartridge from the Finder desktop and then eject it from its drive (after the disk stops spinning).

Don't use a "bulk eraser" to magnetically erase a SyQuest or Ricoh cartridge. The disks inside these cartridges contain servo tracks (magnetic position markers) that are completely lost during such an erase. If these factory-specified servo tracks are removed, you will not be able to reformat the cartridge. Simply trying to reformat in this situation can crash your formatting software and the Mac's operating system, resulting in even worse problems than just one lost cartridge. Also, because the outer shells of SyQuest, Ricoh, and Bernoulli cartridges are nothing more than impact-resistant plastic, they offer no protection against magnetic fields generated by stereo-system speakers, electric motors, telephones, and even your computer's power supply.

Beware of dirt and dust! Imagine a metal disk revolving 3,600 times per minute, with a nearly stationary object (the delicate read/write head) floating no more than eight millionths of an inch above its polished surface. Try to visualize what happens to that fragile read/write mechanism (and to the disk surface) when a cookie crumb, particle of laser-printer toner, or even an ordinary human hair suddenly smashes into it at 50 miles per hour. If you're lucky, you'll lose just a little data; if you're not, you can cause a head crash that permanently damages the read/write head and the disk itself. Our observation is that Ricoh drives benefit from its air-filtering system and cartridge seal, which is superior to those used in SyQuest drives. But don't push your luck.

And don't use pencils to write on the cartridge label. The highly abrasive graphite dust from the pencil mark flakes off as you write and can eventually get inside the cartridge. A better way to label is to use ballpoint pens or fine-point waterproof felt-tip markers. In addition, keep in mind that any adhesive label or tape that doesn't remain securely in place on the exterior of the cartridge may well choose to wander off inside the drive mechanism, where it can cause disastrous damage.

Always keep your SyQuest or Bernoulli cartridge in its original plastic case. This helps keep dirt and dust away and protects the disk from impact. If you drop a cartridge, you can crack the shell or cause enough distortion that you cannot safely insert it into its drive — it doesn't take much. Ricoh cartridges seem less vulnerable to impact, but their flimsy cardboard sleeves don't do much beyond keeping out dust; they certainly don't prevent damage from serious impact. Users of Ricoh cartridges should purchase some sort of dustproof, impact-resistant, closely fitting protective boxes for any cartridges that will do more than sit on a shelf — third-party accessory makers, please take note.

An added warning about Bernoulli cartridges: High temperature can damage a thin plastic Bernoulli disk long before it hurts a metal SyQuest or Ricoh disk, so think twice before leaving your data cartridges inside a hot, sun-baked car. Another warning comes from experienced photographers: If your disk cartridge (just as with a camera and its lens) comes in from the cold outdoors, let that valuable equipment warm up for a few hours before uncovering and using it. Indoor moisture condensing (along with dust) on a disk surface can provoke head damage or even gradual corrosion of the surface.

SyQuest, Ricoh, and Bernoulli drives all have cleaning kits available for routine maintenance of the read/write heads. These kits are cheap, effective insurance against dust contamination. Buy at least one, and use it as directed.

formatted with different software, you may want to temporarily remove from the System Folder any INITs (drivers) that your own cartridges normally require; then restart your computer before attempting to mount the nonstandard cartridge on the desktop. This approach guarantees that the drivers from your regular formatter will not be already loaded into the Mac's RAM and that the nonstandard cartridge will mount while using its own drivers (which normally reside on the cartridge disk, unless it also requires a special INIT). If you do all this, remember to replace any INITs and restart again before mounting one of your own cartridges. If you anticipate dealing with such situations frequently, we suggest that you invest in La Cie's Silverlining software (FWB's equally good formatter may soon be available separately from its drives).

Seek Time Versus the Real World

MacUser Labs performed numerous tests intended to determine the overall performance of each of the 30 magnetic-disk-cartridge drives. We designed the tests to compare differences in average seek time, throughput, and speed in general use. We used the excellent shareware utility SCSI Evaluator (available on Zmac) to test raw speed (seek time and throughput), and we used MacUser Labs' own DiskBasher! program to time a series of reads and writes that approximates the way an application accesses a disk during general use. Finally, to further simulate real-world use, we duplicated a 10-megabyte folder containing several folders holding files of various sizes in the Finder. All these tests together revealed moderate performance differences among the drives.

A drive's seek time (measured in milliseconds) is the average time required for the read/write heads to move between any two tracks on the disk's recording surface. In theory, the lower the average seek time, the faster the drive. Unfortunately, seek time by itself doesn't always reveal how fast a drive really works for you. To get a clear sense of the drive's actual speed, you must take into account its throughput — the rate at which information is read from the disk and passed through the SCSI port from your drive to your Mac. Different drives with the same seek times can show remarkable differences in throughput (see Figure 2).

Each Mac model also has its own maximum throughput, which limits the rate at which it can accept information through its SCSI port. Apple's theoretical rates range from 263K per second (on a Mac Plus) to 2.1 megabytes per second (on a Mac IIci and IIsi). Theoretically, if you want a drive that's truly fast, get one that has a throughput rate that can keep up with your Mac. Unfortunately, none of the drives we tested came close to challenging the maximum throughput of even a Mac SE.

No real knockout winner emerged in the performance categories, and we saw only a few true losers. For the most part, there wasn't much variation: The best drives weren't much faster than those in the midrange. The FWB HammerDisk44 (a SyQuest mechanism) was the overall fastest, followed closely by the MacProducts USA Magic 45, the Rodime Systems R45 Plus, and the PLI Infinity 40 Turbo. All four of the Ricoh drives (from Microtech, Sumo, Univation, and Corel) and both Bernoullis (from Iomega and Ocean) fell into the bottom third for every test except the small-file-duplication test. In fact, in this test the Bernoulli drive from Iomega did as well as most SyQuest drives, because of the excellent Bernoulli data-caching scheme.

Software Makes a Difference

Formatting software (and the method used to install and control device drivers that mount the cartridge) is one of the most important and yet variable aspects of cartridge-drive systems. Some of the software takes a minimalist approach, whereas other programs are quite elegant and have more features

Late Arrivals

Two new cartridge drives weren't released in time to be included in our complete lab tests, but the confident introduction of these new machines into an already crowded market shows how lively the demand is for both SyQuest and Ricoh storage technology.

The Optima Technology DisKovery 45R Removable, which uses a SyQuest mechanism, lists for $1,195 with cartridge, cabling, and SUM II software. Optima Technology Corp., 17526 Von Karman, Irvine, CA 92714; (714) 476-0515.

The GCC Technologies UltraDrive 50R, which uses a Ricoh RH-5500 mechanism, lists for $1,195 with cartridge, cabling, and a customized version of GCC's proprietary DriveManager software. This new Ricoh drive comes from a company that began marketing some of the most popular SCSI storage devices way back when the Mac Plus was the ultimate Mac. GCC Technologies, 580 Winter Street, Waltham, MA 02154; (617) 890-0880.

— Bruce Mewhinney



The UltraDrive 50R (top) from GCC Technologies uses the new Ricoh technology, and the DisKovery 45R Removable from Optima Technology contains a SyQuest mechanism.

than average users will ever need. In addition to simply formatting cartridges, all the formatting software we examined can test disks to find, lock out, and replace weak sectors. These basic functions are about the only things that the different formatters have in common.

One of the main differences among the various formatters is the user interface. MicroNet Utilities from MicroNet has the best interface. FWB's formatter is also easy to use, complete, and powerful. La Cie's Silverlining isn't as straightforward, but it's powerful and offers a variety of useful formatting options. Relax's formatting software, although powerful, is particularly difficult to use, and its testing software is an application separate from the formatting software — an unnecessary and annoying division.

Some formatters have extra features such as the ability to create partitions (which appear as separate volumes on the desktop) or to defragment disks (improving performance by collecting

On the Horizon

Neither SyQuest, Ricoh, nor Iomega (maker of Bernoulli drives) was willing to specify exactly what new products they will introduce in the next several months. However, because of increased data densities and reduced manufacturing costs now possible with magnetic media, 100-megabyte removable drives might appear from both SyQuest and Ricoh sometime in 1991. Of course, even if such high-capacity cartridges do become available, they will still have to prove themselves in the rough-and-tumble world of desktop-publishing service bureaus and airport luggage carousels.

The existing 44-megabyte SyQuest cartridge format continues to gain popularity, and MacAvenue (of Austin, Texas) will offer this technology in its soon-to-be-released Protegé drives. With a cartridge and proprietary DiskMaster software, the compact Protegé drive will list for around $600.

At press time, Microtech announced the new TransPORT formatting software for its Ricoh cartridge drives. TransPORT will allow for both Mac and DOS partitions on the same cartridge; using Apple File Exchange, data can be converted among many IBM PC and Mac formats. Planned upgrades to TransPORT will allow DOS files to be visible and accessible on the Mac desktop, and data transfer with Sun and NeXT computers will be possible.

The new Tranzpak3 (a fast, 3.5-inch, magnetic-hard-disk subsystem from Z Microsystems of Carlsbad, California) is the sort of heavy-duty SCSI storage device that should withstand incredible abuse. The all-metal removable drive modules are small enough to fit two to a briefcase. And — should the need ever arise — they're also designed to U.S. government Tempest durability specs; among other virtues, they'll withstand the EMP (electromagnetic pulse) of a high-level atmospheric nuclear explosion. Substantial key locks can secure the modules in read-only or no-access modes. Each base can hold two modules with combined total capacities of up to 1 gigabyte.

For those who need the speed and reliability of a removable hard-disk subsystem but don't need the extreme durability of the Tranzpak3, Mega Drive Systems (Los Angeles, California) offers compact modules that can hold up to 210 megabytes each. The base units come in one- or two-module configurations with locks to prevent accidental removal.

In mid-1991 expect to see some vendors introducing Mac versions of the intriguing Canon Optical Card, which uses WORM technology from Canon. The Optical Card is the size and thickness of a credit card, holds 2 megabytes of permanent data, and will list for about $10 when purchased in large numbers. These cards (and their Reader/Writer RW-10 drives) are already available for the IBM-compatible market. Optical cards seem the kind of products that Mac users would love; if the card price went even lower (or if Canon introduced an erasable version!), they could become a useful standard for data transport. The Reader/Writer will be equipped with a Mac SCSI interface.



Storage alternatives (clockwise from top left): the durable Tranzpak3 and Mega Drive hard-disk subsystems, Pinnacle Micro REO-130 3.5-inch erasable optical drive, and Canon Optical Card and its Reader/Writer RW-10 drive.

Until now the market for erasable optical storage has been limited by the expense, bulk, and weight of the drives and their 5.25-inch, 650-megabyte cartridges. Pinnacle Micro's new REO-130 and Ocean Microsystems' Vista 130, however, use 3.5-inch, erasable optical cartridges with 128-megabyte capacity and 28-millisecond access time. The drives list for $2,995, with cartridges at $129 each.

Although erasable optical discs are starting to compete with magnetic removable media, only a few manufacturers have ventured into erasable "floptical" technology (using flexible magnetic media instead of higher-capacity, hard-plastic laminates). One such company, Insite Peripherals of San Jose, California, offers floptical drives that use 21-megabyte, 3.5-inch cartridges. These external drives are not yet widely distributed, but they cost no more than around $500 — because of Insite's use of inexpensive, infrared-light-emitting diodes instead of laser read/write heads (among other innovations). Insite has recently licensed its technology to several manufacturers of removable drives — including Iomega. Because current predictions are that 3.5-inch floptical cartridges may soon hold up to 80 megabytes, you can expect them to provide competition for erasable optical drives, which now cost $3,000 to $7,000.

Finally, a speculative comment concerning Insite's floptical drives. At press time, the company had introduced drives capable of reading both 21-megabyte floptical cartridges and existing 3.5-inch 1.4-megabyte magnetic disks. If you think this is what the Mac's future SuperDrives should do, why not send Apple Computer's Product Marketing Department (Mail Stop 76-7X) a persuasive postcard to that effect?

— Steve Costa and Bruce Mewhinney

scattered portions of each file into a minimum number of contiguous data tracks). Iomega's software can format a cartridge in the background within MultiFinder — a handy feature, considering that this process can take up to 30 minutes.

Many of the drives we tested came with nothing more than basic formatting software. Even backup programs were bundled with only about half of the drives. If buyers of these low-cost drives already have comprehensive backup and utility software, then such drives offer an economical system for bulk data storage. However, we suggest shopping for a good drive that ships with a complete repertoire of disk-management utilities. The PLI, Microtech, and La Cie drives all come with excellent formatting software, useful utilities such as Norton Utilities for the Macintosh or SUM II, and some great programs (Microtech's in particular) designed to automate the time-consuming chore of data backup. The Mirror Technologies drives include goodies such as CE Software's QuicKeys Lite (a simple macro program), MockPackage Plus, and DiskTop 3.0.

The People's Choice

Good software is only one of several criteria you should weigh before you decide which cartridge drive to buy. The first consideration will be your intended use for the drive (see the "Bottom Line" sidebar). The more difficult questions involve component quality — power supplies, case material (metal or plastic), ventilation design, and so on. Under their seemingly identical outer cases, all magnetic-disk-cartridge drives are definitely not equal (even if their raw speed and throughput are nearly matched). And don't discount the value of an old-fashioned popularity contest, especially when compatibility among mechanisms is important to you. If a large number of your experienced Mac-owning friends can personally vouch for a product's reliability and you need to share data with them, it might not be a bad idea to join their club — as long as MacUser Labs agrees with their choice.

Steve Costa is the technical-support coordinator for BMUG (Berkeley Macintosh Users Group).

The Bottom Line

If you need fast, unlimited storage in 40- to 50-megabyte increments, if you need to transport large files, or if you need to lock your data in your desk drawer when you go home at night, a magnetic-disk-cartridge drive may be just what you're looking for. We tested the three leading technologies and discovered some clear favorites. While making your choice, remember: Unless you're buying from a mail-order house, list prices are merely starting points for bargaining. Ask your dealer to do some substantial price shaving before you agree on a final figure.

SyQuest-based drives are the fastest, least expensive, and most popular — and popularity can be important when you're using your cartridge to move big graphics files from your Mac to a service bureau. To avoid compatibility problems, however, find out in advance what cartridge drives and formatting software have worked well for local service bureaus or other businesses that will use your cartridges.

Of the 24 SyQuest drives we tested, only a few met our stringent quality criteria: throughput as fast as the underlying technology allows, a well-designed power supply, a metal or very substantial plastic case, external SCSI termination and shielded 50-pin SCSI connectors, an effective cooling system, high-quality formatting software, and easy-to-use documentation.

The winner is the expensive but powerful **FWB HammerDisk44** ($1,395) — but the contest was close. The **MacProducts USA Magic 45** ($495 without cartridge) was just a hair slower than the HammerDisk44, and it was $900 less expensive (although street prices of the HammerDisk44 should be substantially lower than the retail price). Although its documentation was a bit shoddy, we'd recommend the Magic 45 for those who want to save a lot and lose only a little performance.

Other standouts include the **La Cie 45 MB Removable** ($799), **MacTel 45 Removable** ($669), **PLI Infinity 40 Turbo** ($1,199), **Data Enhancements ProCase PS1045-RM** ($649), and **Ehman 45 MB Removable** ($629).

If you need maximum reliability and don't mind its higher price, extra weight, and lower speed, the **Iomega Transportable 44** Bernoulli drive ($1,399) is an excellent choice, as is the well-designed but slower and more expensive **Ocean Microsystems Totem IV 44MB** ($1,550). Also, our recommendation assumes that you don't need SyQuest's installed base of more than 600,000 drives (the PC world included).

The first-generation Ricoh drives are a little slower and cost about $200 more than the average SyQuest drive (the difference is more dramatic when you compare street prices). Ricoh does have a few engineering advantages over SyQuest, however, and these reduce potential damage to cartridge and drive. If you don't mind being an early adopter of this promising new standard, then we can recommend the **Microtech International R50** ($1,299) on the basis of bundled software, customer service, and a modest speed advantage over the other Ricoh drives.



The SyQuest champ is the FWB HammerDisk44 (top), the best Bernoulli is the Iomega Transportable 44 (center), and the best Ricoh drive is the Microtech International R50.

Table 1: Pros and Cons of Removable Media

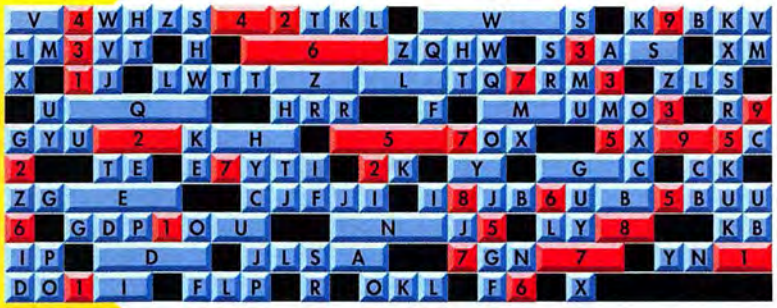
	Pros	Cons	Ideal Users
Hard-disk cartridge (SyQuest)	• Fast. • Moderate cost per megabyte. • Widely used and distributed.	• Vulnerable to dust, impact, and magnetic fields. • Driver-software incompatibilities.	• SyQuest drives are popular with office workers and desktop publishers who routinely transport large files and need compatibility with many remote locations.
Hard-disk cartridge (Ricoh)	• Fast. • Moderate cost per megabyte. • Improved seal against dust.	• Vulnerable to impact and magnetic fields. • Small installed base.	• Ricoh drives are best for individuals concerned about transporting data through dusty environments and less concerned about exchanging data with other users.
High-capacity flexible disk (Bernoulli)	• Moderately fast. • Reliable. • Portable drive available (Iomega).	• Noticeable noise level. • Hardware costly, heavy. • Media vulnerable to magnetic fields. • Drive and cartridges need maintenance.	• Bernoulli drives are best for office workers and desktop publishers needing maximum reliability for backup or data transport but not for long-term, uninterrupted disk access.
Floppy disk (800K)	• Cheap. • Small and lightweight. • Usable by all Macs (new 1.4-megabyte format can be read only by Macs equipped with SuperDrive).	• Slow. • Smallest capacity. • Easy to damage. • Media vulnerable to magnetic fields.	• Floppies can transport small files, distribute commercial software, and even perform low-budget backup (using Apple's HDBackup or third-party programs).
Removable hard-disk subsystem	• Fast. • Large capacities available. • High reliability (read/write heads and disks are sealed together). • Media protected from magnetic fields.	• Expensive. • Bulky and heavy.	• Hard-disk subsystems are perfect for general office workers and desktop publishers who need high reliability and security for secondary storage, backup, or transporting large files.
Erasable optical cartridge	• Moderately fast. • High reliability and data stability. • Immune to common magnetic fields. • Low cost per megabyte. • Large capacity.	• Expensive hardware and media.	• Erasable optical drives are used in scientific, engineering, and prepress work involving very large files, where maximum reliability and security are essential for transport or backup.
Tape cartridge/ cassette	• Lowest cost per megabyte. • Large capacities available. • Small and lightweight.	• Very slow; not random access. • Media vulnerable to magnetic fields. • Not usable as startup device. • Usually inaccessible from the Finder. • Several incompatible formats.	• Tape drives are best for office workers and desktop publishers who perform routine backup of many or very large files but don't need fast access to that stored data.

Table 2: Features of Magnetic-Disk-Cartridge Drives

					
Technology ● = yes ○ = no	**Bernoulli** **Iomega** **Transportable 44** ★★★★½	**Bernoulli** **Ocean** **Totem IV 44MB** ★★★½	**Ricoh** **Corel** **50 MB Removable** ★★★	**Ricoh** **Microtech** **R50** ★★★★	**Ricoh** **Sumo** **SSER 50 Removable** ★★★½
List price	$1,399 $1,699 Portable	$1,550 w/ cartridge $2,550 Totem IIID dual	$1,295 drive w/ kit $295 kit only	$1,299 w/ cartridge	$1,300
Comments	Cache improves speed over that of Ocean drive. Formats disks under MultiFinder. Portable model available.	New driver should improve performance. Bundled with MacTools Deluxe. Attractive vertical case. Slowest.	Documentation written for optical drive, with cartridge-drive addendum.	Fastest Ricoh drive. Bundled with Norton Utilities and Total Recall. Includes two SCSI cables.	Good documentation. Supports A/UX drive partitions. Bundled with Retrospect.
Hardware					
UL approval	yes	no	yes	yes	yes
Advertised capacity	44 MB	44 MB	50 MB	50 MB	50 MB
Formatted capacity	42.7 MB	42.6 MB	46.6 MB	46.6 MB	46.6 MB
SCSI-ID selection	ext. push wheel	ext. push wheel	ext. push wheel	ext. push wheel	ext. push wheel
SCSI termination	int. on/off switch	external	external	external	external
SCSI connectors	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics
Bundled software					
Formatting software	OnTrack Disk Manager	proprietary (Compass)	proprietary	proprietary	proprietary
Partitioning	●	●	○	○	●
Backup	○	●	○	●	●
Password protection	○	●	○	○	●
Data encryption	○	●	○	○	○
Data recovery	●	●	○	●	○
Disk optimizer	○	●	○	●	○
Diagnostic software	○	○	●	●	●
Mounting utility	application	application	INIT	INIT	INIT/cdev
Other					
Case (metal, plastic)	plastic-coated metal	metal	metal	plastic	metal
Fan	yes	yes	yes	yes	yes
Dimensions (L x W x H)	11 x 9.5 x 3 in.	10.5 x 3 x 10.5 in.	10 x 9.5 x 2.5 in.	10.5 x 10 x 2 in.	10 x 9.5 x 2 in.
Warranty	1 year (disk, 5 years)	1 year (disk, 5 years)	1 year	2 years (disk, 1 year)	1 year
	Iomega Corp. 1821 W. 4000 South Roy, UT 84067 (800) 456-5522 (801) 778-1000	Ocean Microsystems 246 E. Hacienda Ave. Campbell, CA 95008 (800) 262-3261 (408) 374-8300	Corel Systems 1600 Carling Ave., #190 Ottawa, Ontario K1Z 8R7 Canada (613) 728-8200	Microtech International, Inc. 158 Commerce St. East Haven, CT 06512 (800) 325-1895 (203) 468-6223	Sumo Systems 1580 Old Oakland Rd. Suite C103 San Jose, CA 95131 (408) 453-5744

This is your hard disk severely fragmented

This is how a typical fragmented hard disk looks. The abuse fragmentation can deal is a crime, and it's causing a national epidemic in offices everywhere. But the more you use your computer, the more your files are spread all over your hard disk. As a result, your disk has to work a whole lot harder than it has to. And increased head movement not only slows down your file access times, it will slow you down, too.



This is your hard disk defragmented

Even defragmentation software can't help much. Wimpy defraggers just place pieces of individual files adjacent to each other. Defraggers just don't have the intelligence to constantly monitor your file useage. So, any increases in performance are modest and only temporary, disappearing as soon as you use your computer again.



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Frequently used files *Seldom used files* *Free space*

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Please circle 71 on reader service card.

Table 2: Features of Magnetic-Disk-Cartridge Drives, continued

					
Technology ● = yes ○ = no	**Ricoh Univation Q50** ★★½	**SyQuest Alliance Peripheral 45 MB Removable** ★★★	**SyQuest Bay MicroSystems 44 RePack** ★★★	**SyQuest ClubMac 44 MB** ★★★	**SyQuest CMS Enhancements MacStack SD45RM** ★★½
List price	$1,395	$599 w/ cartridge $999 dual w/ cartridge	$675 w/ cartridge $72 add. cartridge	$539 w/ cartridge	$1,399
Comments	Rudimentary software. Fan can scrape if power cable is stressed because of poor positioning.	Toll-free tech support. Bundled with 12.5 megabytes of shareware. Rudimentary documentation.	Well-written documentation. Rudimentary software.	Quiet fan. Rudimentary documentation. Plastic version is very flexible. Supports A/UX drive partitioning.	Excellent documentation. Auto-switching power supply. High list price for SyQuest drive.
Hardware					
UL approval	no	yes	yes	yes	yes
Advertised capacity	50 MB	45 MB	44 MB	44 MB	45 MB
Formatted capacity	46.6 MB	42.6 MB	42.6 MB	42.5 MB	42.6 MB
SCSI-ID selection	ext. push wheel	ext. DIP switch	ext. push wheel	ext. push wheel	ext. DIP switch
SCSI termination	external	external (included)	external	external	internal
SCSI connectors	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics
Bundled software					
Formatting software	proprietary	proprietary	proprietary	SCSI Commander	proprietary
Partitioning	●	○	○	●	●
Backup	○	○	○	○	○
Password protection	●	●	○	○	●
Data encryption	○	○	○	○	○
Data recovery	●	○	○	○	○
Disk optimizer	○	○	○	○	○
Diagnostic software	●	●	●	●	●
Mounting utility	cdev	cdev	INIT	INIT	INIT
Other					
Case (metal, plastic)	metal	metal	plastic	metal or plastic	metal
Fan	yes	yes	yes	yes	yes
Dimensions (L x W x H)	10 x 9.5 x 2.5 in.	10.5 x 10 x 3 in.	10 x 9.5 x 2.5 in.	10 x 9.5 x 2.5 in.	10.5 x 10 x 3 in.
Warranty	1 year	2 years (disk, 1 year)	1 year	2 years (disk, 1 year)	1 year (opt. extended warranty, $119/year)
	Univation 600 Valley Way Milpitas, CA 95035 (408) 263-1200	Alliance Peripheral Systems 2900 S. 291 Hwy. Independence, MO 64057 (800) 233-7550 (816) 478-8300	Bay MicroSystems, Inc. 210 Columbus Ave. Suite 108 San Francisco, CA 94133 (415) 563-8392	ClubMac 7 Musick Irvine, CA 92718 (800) 258-2622 (714) 768-1490	CMS Enhancements 2722 Michelson Dr. Irvine, CA 92715 (714) 222-6000

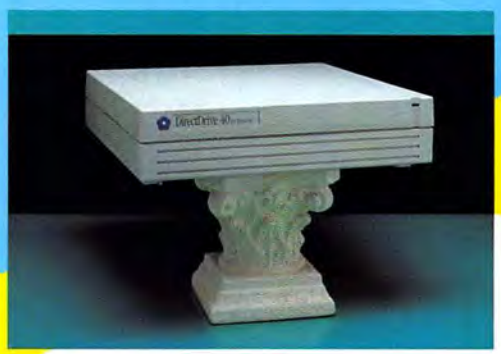
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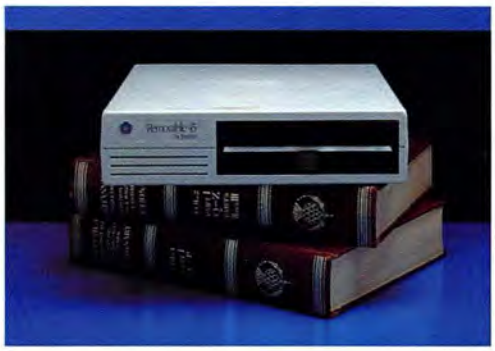
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Table 2: Features of Magnetic-Disk-Cartridge Drives, continued

					
Technology ● = yes ○ = no	**SyQuest** **Computer Products** **DataStor DS44/25MR** ↕↕½	**SyQuest** **Cutting Edge** **44 MB Removable** ↕↕↕	**SyQuest** **Data Enhancements** **ProCase PS1045-RM** ↕↕↕½	**SyQuest** **DPI** **44 Removable** ↕↕↕↕	**SyQuest** **Ehman** **45 MB Removable** ↕↕↕½
List price	$569 w/ cartridge	$1,149	$649	$599	$629
Comments	Quiet fan. Rudimentary documentation and software.	Well-built. Dual-fuse protection. High list price for SyQuest drive. Two switched AC outlets.	Powerful software. Supports A/UX drive partitioning. SCSI address in desktop icon.	Vertically mounted drive in sturdy metal case. Diode-regulated fan assures cool operation.	Well built. Dual-fuse protection. Two switched AC outlets.
Hardware					
UL approval	yes	yes	no	yes	yes
Advertised capacity	44 MB	44 MB	45 MB	44 MB	45 MB
Formatted capacity	42.6 MB	42.5 MB	42.5 MB	42.6 MB	42.5 MB
SCSI-ID selection	ext. thumb wheel	ext. push wheel	ext. thumb wheel	ext. push wheel	ext. push wheel
SCSI termination	external	external	int. (ext. option, $35)	internal	internal
SCSI connectors	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics
Bundled software					
Formatting software	proprietary	proprietary	SCSI Commander	proprietary	proprietary
Partitioning	○	○	●	●	○
Backup	○	●	●	○	●
Password protection	○	○	●	○	○
Data encryption	○	○	○	○	○
Data recovery	○	○	○	○	○
Disk optimizer	○	○	○	○	○
Diagnostic software	●	●	●	●	●
Mounting utility	INIT	INIT	cdev	INIT	INIT
Other					
Case (metal, plastic)	plastic	metal	metal	metal	metal
Fan	yes	yes	yes (variable speed)	yes	yes
Dimensions (L x W x H)	10 x 9.5 x 2.5 in.	10.5 x 10 x 2.5 in.	10.5 x 10 x 3 in.	12.5 x 3.5 x 6 in.	10.5 x 9.5 x 2 in.
Warranty	1 year	2 years (disk, 1 year)	1 year	2 years	2 years (disk, 1 year)
	Computer Products Corp. 4657 MacArthur Ln. Boulder, CO 80303 (800) 338-4273	Cutting Edge 97 S. Red Willow Rd. Evanston, WY 82930 (307) 789-0582	Data Enhancements, Inc. 31328 Via Colinas, #102 Westlake Village, CA 91362 (818) 879-2700	DPI 40 Corning Ave. Milpitas, CA 95035 (800) 825-1850 (408) 945-1850	Ehman Engineering, Inc. 97 S. Red Willow Rd. Evanston, WY 82930 (800) 257-1666 (307) 789-3830

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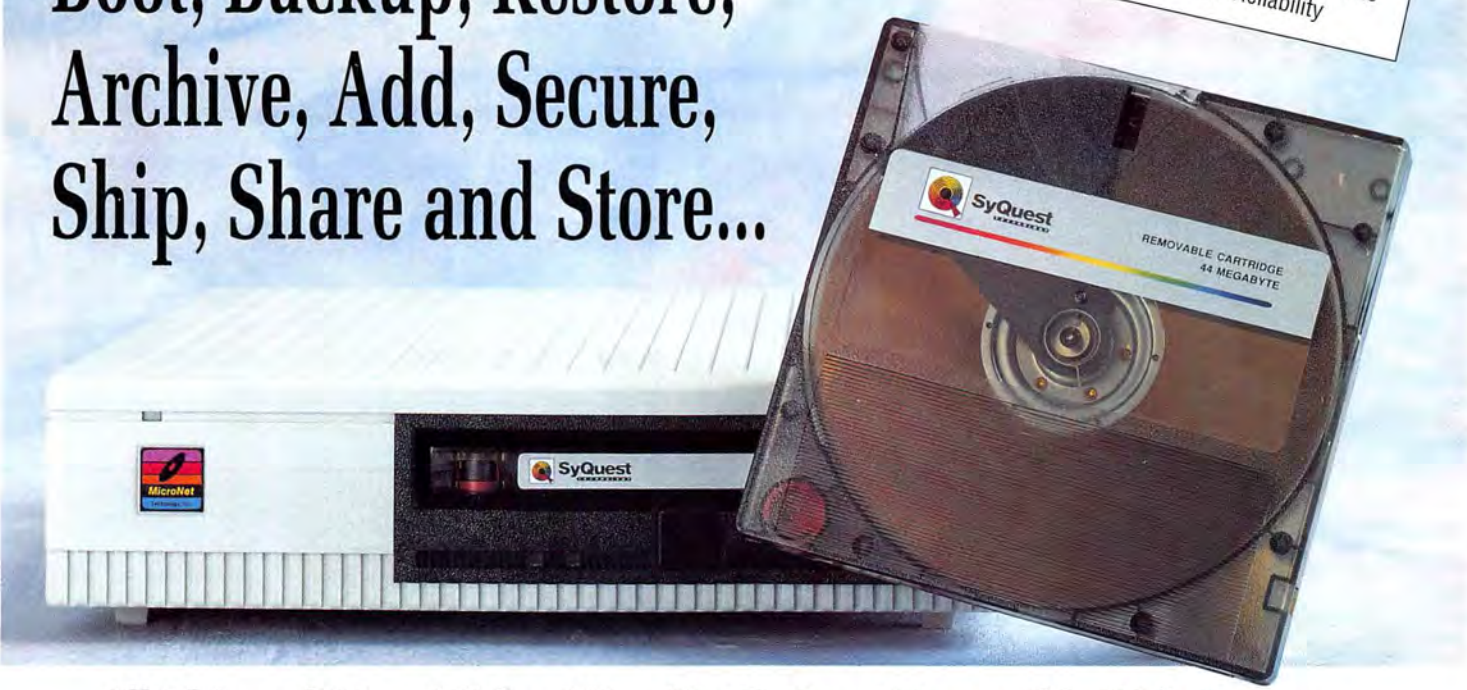
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Table 2: Features of Magnetic-Disk-Cartridge Drives, continued

					
Technology ● = yes ❍ = no	**SyQuest** **FWB** **HammerDisk44** $ssss^{1/2}$	**SyQuest** **Hard Drives Int'l.** **PowerDrive 44** $sss^{1/2}$	**SyQuest** **La Cie** **45 MB Removable** $ssss$	**SyQuest** **MacLand** **SyQuest 42 MB** sss	**SyQuest** **MacProducts USA** **Magic 45** $ssss$
List price	$1,395	$575 w/ cartridge $79 add. cartridge	$799	$575 w/ cartridge	$495 $71 cartridge
Comments	Fastest. Slim and sturdy. High list price for SyQuest drive. Bundled with powerful utilities.	No shielding on SCSI connectors. Toll-free tech support. 30-day "worry-free" guarantee. Good software.	Solidly built. Bundled with Silver Platter and Norton Utilities. Auto-switching power supply.	Bundled with Smart-Image archiving utility and SmartRestore restoration utility.	Second-fastest. Least expensive. Outdated documentation. Best SyQuest buy.
Hardware					
UL approval	yes	yes	no	no	yes
Advertised capacity	44 MB	44 MB	44 MB	42 MB	45 MB
Formatted capacity	42.6 MB	42.5 MB	42.4 MB	42.5 MB	42.5 MB
SCSI-ID selection	ext. push wheel	ext. push wheel	ext. DIP switch	ext. thumb wheel	ext. push wheel
SCSI termination	external	external	internal switched	external	external
SCSI connectors	2, 50-pin Centronics	2, 50-pin Centronics	2, 25-pin DB-25	2, 50-pin Centronics	2, 50-pin Centronics
Bundled software					
Formatting software	proprietary	OnTrack Disk Manager	Silverlining	proprietary	OnTrack Disk Manager
Partitioning	●	●	●	❍	●
Backup	❍	●	❍	●	●
Password protection	●	●	●	❍	❍
Data encryption	●	❍	❍	❍	❍
Data recovery	❍	❍	●	❍	●
Disk optimizer	❍	●	●	❍	❍
Diagnostic software	●	●	●	●	❍
Mounting utility	INIT	INIT	INIT (launchable)	INIT	INIT
Other					
Case (metal, plastic)	metal	metal	metal	plastic	metal
Fan	yes	yes	yes	yes	yes
Dimensions (L x W x H)	10 x 10 x 2 in.	10 x 10 x 2.5 in.	10 x 9.5 x 2 in.	11 x 10 x 2.5 in.	11 x 10 x 2.5 in.
Warranty	1 year	2 years (replacement)	1 year	1 year	2 years
	FWB, Inc. 2040 Polk St., #215 San Francisco, CA 94109 (415) 474-8055	Hard Drives International 1912 W. 4th St. Tempe, AZ 85281 (800) 767-3475 (602) 967-4999	La Cie Ltd. 19552 S.W. 90th Ct. Tualatin, OR 97062 (800) 999-0143 (503) 691-0771	MacLand, Inc. 4685 S. Ash Ave., H-5 Tempe, AZ 85282 (800) 333-3353 (602) 820-5802	MacProducts USA 8303 Mopac Expy. Suite 218 Austin, TX 78759 (800) 622-3475 (512) 343-9441

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	MicroNet	Ricoh	Bernoulli
System w/ Cartridge	$1,145	$1,428	$1,920
Single Cartridge Cost	$129	$129	$125
Average Seek Time	20 ms	25 ms	32 ms
Head Cleaning Kit	N/R	N/R	$65
Interface Kit for Macintosh	N/R	N/R	$55
Head Load Time	0 ms	0 ms	165 ms
Media Life (100% duty cycle)	5 yrs	5 yrs	1/2 yrs
Winchester Technology	Yes	Yes	No
Noise Level	< 50 dBa	55 dBa	48 dBa
Installed Base	450,000	50,000	600,000

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Table 2: Features of Magnetic-Disk-Cartridge Drives, continued

					
Technology ● = yes ○ = no	**SyQuest** **MacTel** **45 Removable** **$$$$**	**SyQuest** **Mass Microsystems** **DataPak 45** **$$$$**	**SyQuest** **MicroNet** **MR45** **$$$$**	**SyQuest** **Mirror** **RM42** **$$$$**	**SyQuest** **PLI** **Infinity 40 Turbo** **$$$$**
List price	$669	$1,199	$1,145 w/ cartridge $1,245 w/ Retrospect	$677	$1,199
Comments	Supports A/UX drive partitioning. Excellent software includes BackMatic and Auto-Save II backup software.	Excellent documentation. Two switched AC outlets. Bundled with Disk Doubler. High list price for SyQuest drive.	Excellent documentation. Very powerful software. Well-shielded power supply. High list price for SyQuest drive.	Sturdily built. Bundled with QuicKeys, DiskTop, MockPackage+, and 10 megabytes of public-domain software.	Sturdily built. Bundled with TurboSpool, AME, TurboCache, StuffIt, shareware. High list price for SyQuest drive.
Hardware					
UL approval	yes	no	no	no	yes
Advertised capacity	45 MB	45 MB	45 MB	42 MB	40 MB
Formatted capacity	42.6 MB	42.6 MB	42.5 MB	42.5 MB	42.6 MB
SCSI-ID selection	ext. push wheel	ext. push wheel	ext. push wheel	ext. push wheel	ext. push wheel
SCSI termination	external	internal	external	external	ext. DIP switch
SCSI connectors	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics
Bundled software					
Formatting software	proprietary	proprietary	proprietary	proprietary	proprietary
Partitioning	●	●	●	●	●
Backup	●	○	○	●	●
Password protection	●	●	●	●	●
Data encryption	●	○	○	○	●
Data recovery	●	○	○	○	●
Disk optimizer	○	○	○	○	●
Diagnostic software	●	●	●	●	●
Mounting utility	INIT	INIT	application	cdev	INIT
Other					
Case (metal, plastic)	metal	plastic	plastic	metal	metal
Fan	yes	yes	yes	yes	yes
Dimensions (L x W x H)	10 x 10 x 2 in.	10 x 9.5 x 2.5 in.	10.5 x 10 x 3 in.	11 x 10 x 2 in.	10 x 9.5 x 2 in.
Warranty	1 year	2 years	1 year	2 years	1 year (opt. extended warranty, $140/year)
	MacTel Technology 3007 N. Lamar Blvd. Austin, TX 78705 (800) 950-8411 (512) 451-2600	Mass Microsystems 810 W. Maude Ave. Sunnyvale, CA 94086 (800) 522-7979 (408) 522-1200	MicroNet Technology, Inc. 20 Mason Irvine, CA 92718 (714) 837-6033	Mirror Technologies 2644 Patton Rd. Roseville, MN 55113 (800) 654-5294 (612) 633-4450	PLI 47421 Bayside Pkwy. Fremont, CA 94538 (800) 288-8754 (415) 657-2211

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Table 2: Features of Magnetic-Disk-Cartridge Drives, continued

					
Technology ● = yes ○ = no	**SyQuest** **Relax** **Mobile 42** ★★★½	**SyQuest** **Rodime** **R45 Plus** ★★½	**SyQuest** **Ruby** **StarDrive 45RX** ★★★	**SyQuest** **Third Wave** **45R** ★★★½	**SyQuest** **Total Peripherals** **TP-44R** ★★★
List price	$529 w/ cartridge	$1,399	$1,125	$629	$799
Comments	Auto-switching power supply. Built-in surge protecter. Poorly written documentation. Very quiet fan.	Flexible case. High list price for a SyQuest drive. Few features.	Slowest SyQuest drive. Excellent documentation with extensive trouble-shooting guide. Expensive for SyQuest.	Auto-switching power supply. Bundled with Fontina utilities, 12 megabytes of shareware, and HyperDeck.	Auto-switching power supply. Rudimentary documentation. Noisy fan.
Hardware					
UL approval	yes	yes	no	yes	no (FCC Class B)
Advertised capacity	42 MB	45 MB	45 MB	45 MB	44 MB
Formatted capacity	42.5 MB	42.5 MB	42.6 MB	42.5 MB	42.5 MB
SCSI-ID selection	ext. push wheel	ext. push wheel	ext. push wheel	ext. push wheel	ext. push wheel
SCSI termination	external	external	int. resistor pack	external	internal
SCSI connectors	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 50-pin Centronics	2, 25-pin DB-25
Bundled software					
Formatting software	proprietary	proprietary	proprietary	proprietary	proprietary
Partitioning	●	●	○	●	○
Backup	●	○	●	○	○
Password protection	○	○	○	●	○
Data encryption	○	○	○	○	○
Data recovery	○	○	○	○	○
Disk optimizer	○	○	○	○	○
Diagnostic software	●	○	○	●	●
Mounting utility	DA and INIT	INIT	INIT	DA	application
Other					
Case (metal, plastic)	metal	plastic	metal	plastic-covered metal	metal
Fan	yes	yes	yes	yes	yes
Dimensions (L x W x H)	11 x 10 x 2.5 in.	10 x 9.5 x 2.5 in.	10.5 x 10 x 2 in.	10 x 10 x 2.5 in.	10.5 x 10 x 3 in.
Warranty	2 years	2 years (disk, 1 year)	1 year	2 years	1 year
	Relax Technology, Inc. 3101 Whipple Rd. Union City, CA 94587 (415) 471-6112	Rodime Systems, Inc. 901 Broken Sound Pkwy. Boca Raton, FL 33487 (800) 688-9390 (407) 994-5585	Ruby Systems, Inc. 930 Thompson Pl. Sunnyvale, CA 94086 (800) 888-1668 (408) 735-8668	Third Wave Computing, Inc. 1826-B Kramer Ln. Austin, TX 78758 (800) 284-0486 (512) 832-8282	Total Peripherals, Inc. 1 Brigham St. Marlboro, MA 01752 (508) 460-0764



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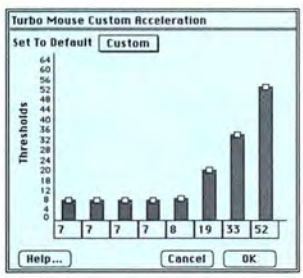
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BY KATHLEEN TINKEL

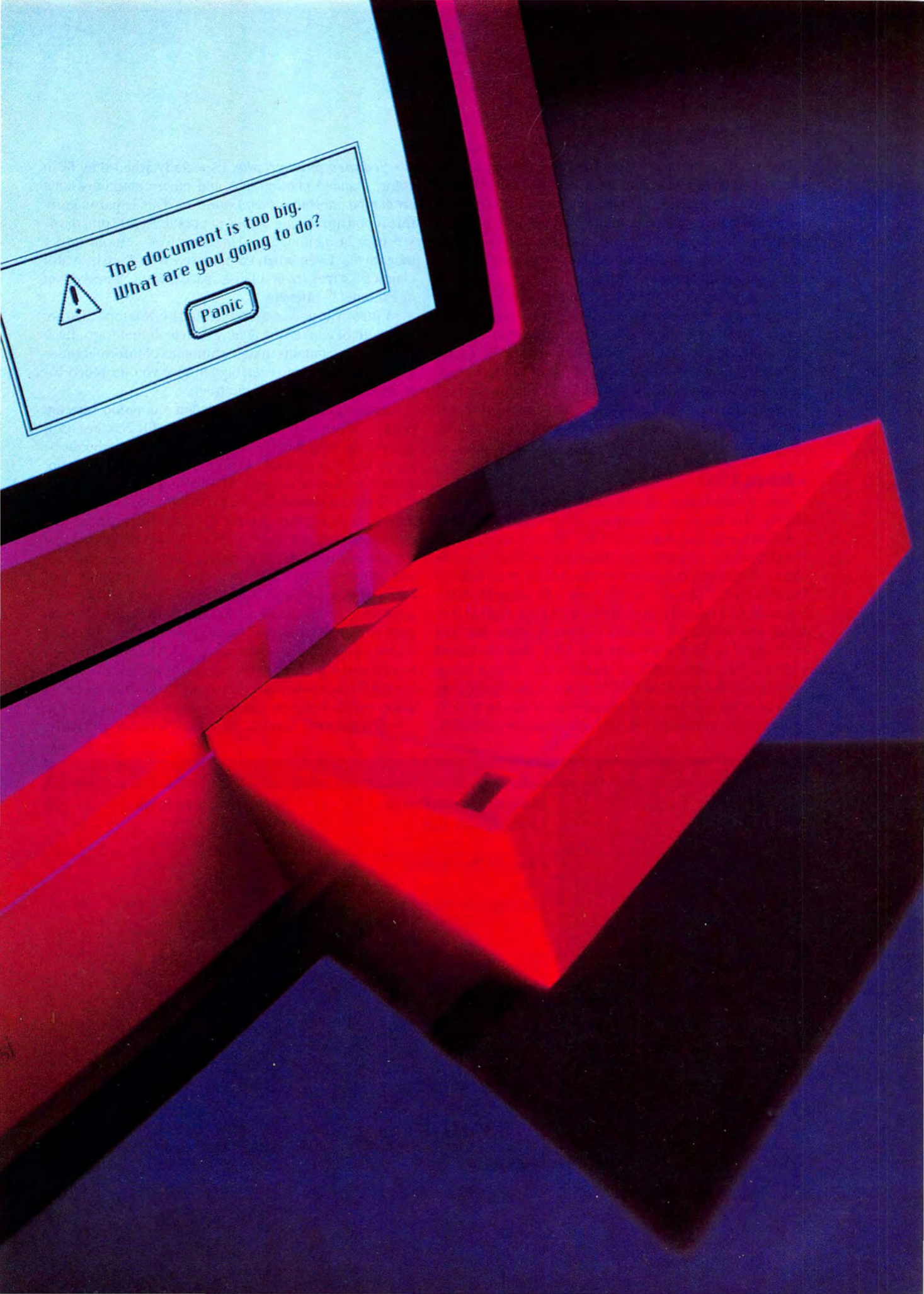
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PHOTOGRAPHY: CHARLES CHAT


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What are you going to do?
Panic

Too Big to Fit on a Floppy?

Just what constitutes a large file? The answer is relative. If you have a Mac Plus with a single 800K floppy-disk drive (or even a 20-megabyte hard-disk drive), a 1-megabyte file can pose major storage and memory problems. If you regularly work with desktop color on a IIfx, on the other hand, it may take a 30-megabyte file to make you sit up and take notice.

You may be able to alleviate your large-file headaches by changing the way you work. If the problems are more severe, however, you may have to upgrade or replace your Mac, add RAM, buy additional storage or an accelerator, buy a compression package, replace your modem, or modify a network. To help you choose the best solution(s), here are some strategies for handling the most common problems. (Future articles will cover specific remedies, such as data compression, in more depth.)

Making It Big

Any program may occasionally generate large files, but big files are almost automatic in the following cases:

• ***PostScript graphics.*** An EPS illustration with sophisticated color blends or an abundance of control points can easily eat up a megabyte or two of disk space (see "A Fruitful Use of Blends" in this issue's Desktop Publishing section). I recently came across a 32-page PageMaker document with eight scanned-in photographs that had been saved as EPS files. Because EPS files are stored within a PageMaker file — rather than simply being linked to the document as TIFF files are — the PageMaker document weighed in at 35 megabytes. It had to be sent to the service bureau on a removable magnetic cartridge.

• ***Scanned photographs.*** Especially when they're in color, scanned photographs and other continuous-tone art can be enormous (see Figure 1). This is particularly true if you are storing 24 bits per pixel. At 300 dpi, the 4-x-5-inch 24-bit image used in the network tests ate up 5.1 megabytes. Even when compressed with StuffIt, it still claimed 3.4 megabytes of disk space (see the "SneakerNet or Ethernet?" sidebar).

• ***Video.*** The massive files created by desktop video are the result of converting analog data to digital form. Each video frame contains massive amounts of information — and the files become even bigger once you've added 16- or 24-bit color and an audio track.

• ***Animation.*** It's no wonder that animation files are huge — the most common file format, PICS, consists of a series of linked PICT images, each of which can be pretty large on its own. At 30 frames per second, a one-minute animation consists of 1,800 individual images.

• ***Digitized sound.*** Digitized (or sampled) sound files, such as those created by Farallon's MacRecorder and the digitizers built in to the new Mac LC and IIsi, prove that time is memory. At 22 kilohertz (and 8-bit resolution), one minute of digitized sound eats 1.32 megabytes of memory. Capturing CD-quality sound with editing systems such as Digidesign's Sound Tools demands even greater memory reserves (see Figure 2). One minute of sound sampled at a frequency of 44.1 kilohertz (16-bit resolution) requires 5.3 megabytes of memory.

• ***CAD (computer-aided design).*** Large drawings with many detailed objects can easily run a megabyte or two.

• ***HyperCard.*** Stacks can often become unwieldy,

Table 1: Curing Big-File Headaches

Symptoms	No-cost solutions	Upgrade options
• Out of RAM	• Minimize file size.	• Add more RAM. • Add virtual memory.
• Slow response time	• Rebuild the Desktop file. • Defragment the hard disk.	• Add an accelerator or cache card. • Add a faster hard drive. • Buy a supercharged Mac.
• Overflowing hard disk	• Delete or archive files no longer in use. • Compress files. • Partition the hard disk.	• Add a larger hard drive. • Add a removable-cartridge drive.
• Telecom tie-ups	• Compress files before transmitting. • Use Zmodem instead of Xmodem.	• Buy compression software/hardware. • Buy a faster modem.
• Network traffic jams	• Isolate heavy traffic. • Minimize use of routers.	• Add Ethernet. • Use an active-star topology.

particularly if they contain sound. Multimegabyte stacks are not uncommon.

Housekeeping and Beyond

Whatever their source, large files can create havoc. The problems aren't limited to basic housekeeping such as storage and transportation. Here's a short list of other trouble spots:

• ***RAM.*** Your Mac's memory is shared by system files (including MultiFinder and miscellaneous cdevs, DAs, and INITs), fonts, software, and open files. If a program can't find the large unused blocks of contiguous memory it needs to perform RAM-intensive operations — rotating a large graphic or printing in certain applications, for example — the process may proceed very slowly and your Mac might even freeze or crash.

• ***Applications.*** When a large document is open, you may find that some operations within applications — screen redraw, selecting or moving an object, or saving a file under a new name — slow down.

• ***Hard-disk drives.*** Large documents quickly fill up hard drives. If your drive is near capacity, files will become fragmented, because they must be broken up to fit into smaller blocks of free space, which slows things down even more.

• ***Networks.*** Large files generally process slowly and can bog down a network. Depending on the type of network — LocalTalk or Ethernet — and the file-serving software you're using, a large document that resides on a file server can take several minutes to open or save and even longer to print.

• ***Telecommunications.*** Transmitting large files to and from on-line services and service bureaus ties up both your Mac and the one on the other end of the transaction. It also pushes up your telephone and on-line-service charges. Because file transfers are often a pass/fail proposition, long sessions make you vulnerable to line noise and other interruptions.



JANEK KALICZAK

Figure 1: Full-color images — such as 24-bit scanned photos — are a major source of big-file headaches. Using 24-bit color can result in gigantic files — this image occupies 4.5 megabytes of disk space, for example. But it's not just disk real estate that's affected; the file also eats RAM and takes forever to be transmitted across a network or modem.

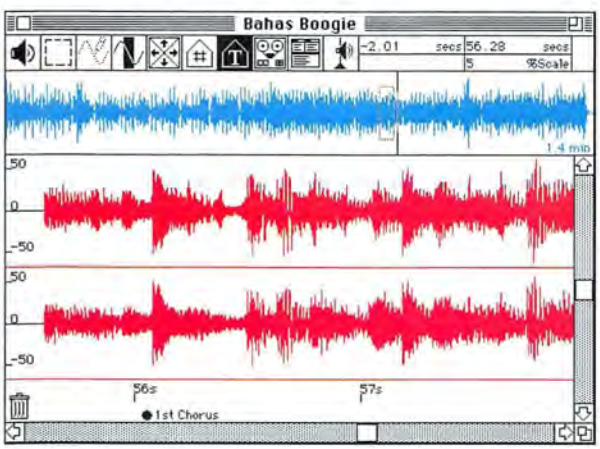


Figure 2: CD-quality sound files such as the Bahas Boogie can be enormous. This one-and-a-half-minute piece takes up 15 megabytes of disk space. Digidesign's Sound Tools was used to do the final stereo mix.

Working Smarter (and Smaller)

If you regularly create files larger than your system can handle, the long-term solution seems obvious: Buy a faster Mac with more RAM (the IIfx can have up to 32 megabytes) and a larger hard drive (there are now internal drives offering up to 1.7 gigabytes), and add peripherals and accessories designed to make the processing of very large files faster and smoother. Such goodies might include a PMMU chip, a floating-point-math coprocessor, a graphics accelerator, or a general system accelerator.

But before you refinance your home to buy hotter hardware, try making some relatively low-tech changes in the way you work and see if they help:

• ***Clean up your hard drive.*** Most of us just accumulate files until we run out of space and then archive older documents and trash duplicates. It makes more sense to set up a procedure that moves files off your hard drive to dead storage (tape backup or removable cartridges, for example) on a regular basis. Try doing it weekly or at least after completing a project.

While you're paring down your hard drive, look at application folders. Although most programs do not have gigantic files, you may have installed demonstration or template files. If you don't need them, throw them out. Check your System Folder while you're at it. I often find Preferences or Default files for programs I no longer use. They may not be enormous, but every little bit helps. If you use Suitcase II, you can compress your screen fonts with Font & Sound Valet. This utility (included with Suitcase II) squeezes font suitcases by up to 60 percent and sound files by up to 20 percent, and it automatically decompresses files for use.

• ***Reorganize your hard-disk storage.*** Set up separate partitions (or use removable drives) for your files: one or

more partitions for active projects, another for completed jobs waiting to be billed or otherwise wrapped up, and a final one for closed jobs ready to be archived. Each partition is treated as a separate volume, so that file operations affect only that portion of the hard disk (see Figure 3). Partitions also reduce the fragmentation of free space into small discontiguous chunks, and you can quickly defragment a single partition instead of the entire hard disk. (Fragmentation forces files to be broken up across the hard disk, significantly degrading performance.) Regularly review the partitions, and reorganize files as needed. By focusing regular attention on your files, you can keep your hard drive stripped to its essentials.

• ***Consider using a removable-media drive.*** A SyQuest or Bernoulli cartridge or an erasable optical disc can relieve your primary hard drive. Use a removable for a large project, for the work of a single client, for project resources — logos or clip art, layout templates, or other elements that are used repeatedly — or some other logical subset of your files. Alternatively, set up a removable cartridge or disc with application software you use only occasionally.

• ***Rebuild your Desktop files regularly.*** This is particularly important if you've been shuffling lots of files around. When you turn on or restart the Mac, hold down the Command and Option keys after the last INIT has loaded until you see a dialog box asking if you want to rebuild the Desktop. The Mac will rebuild each disk or partition in turn, because each has its own Desktop file.

• ***Reduce document size when you can.*** Sometimes the same steps that produce smaller files also yield files that calculate and print faster. Occasionally forcing your application to perform a full save (by using Save As) can dramatically reduce the size of a heavily edited document. When handling graphics files, crop images — particularly memory-hogging continuous-tone artwork — *before* you place them in page-layout programs. Eliminating unneeded information reduces file size; cropping an image after you've placed it usually doesn't affect file size, because the program stores the entire image in case you want to recrop it later. Link illustrations instead of embedding them in the layout document, to avoid storing the artwork on your drive twice.

• ***When scanning, use the lowest resolution that doesn't compromise quality.*** If you're using halftone scans for position only, 75 dpi is usually adequate. You can further minimize the bulk of page-layout files by eliminating "for position only" TIFFs before you send the job for output. Instead, leave a window on the layout and enclose a laser proof with the job to show the stripper how to scale and crop the halftones. PageMaker lets you compress TIFF files as you place them; always do so, as it reduces the size of the file. With other applications, use image-compression software (described later).

SneakerNet or Ethernet?

If you've ever suffered through trying to move large color-graphics files across a network, the odds are good that you have learned two things: LocalTalk is too slow, and routers are even slower. (Routers are devices used to connect several small networks in a larger "internet.") People who can't afford to upgrade their networks to Ethernet usually settle for SneakerNet, often opting to use removable cartridges.

The MacUser Labs NetWorkShop tackled this problem to see just how long it takes to copy a 5-megabyte (actually 5.1-megabyte) scanned color image from a Mac IIci, acting as an AppleShare server, to a Mac IIfx workstation. The Labs timed this file transfer over several common network configurations (see Figure A). Here's what we learned:

LocalTalk moves data a lot slower than Ethernet does. No big surprise there. You may be surprised to learn, however, that although Ethernet is rated at 40 times the bandwidth (speed) of LocalTalk, its real-world performance is nowhere near that impressive. When used for practical tasks such as the AppleShare file transfers in our tests, Ethernet's data-throughput rate (how much "real data" gets from here to there) is only three to four times that of LocalTalk.

And then there are those pesky routers. Don't get us wrong: Routers have a definite role in life. One of their main uses is to make networks less busy by divvying them up into smaller subnetworks that are distinct yet connected to one another. This means that people in the sales department who want to exchange files don't have to share a network wire with people in engineering, who in turn are exchanging files among themselves. The problem comes when someone in engineering wants to send a file to someone in sales. The file then has to go through a router, which increases the file-transfer time dramatically.

The worst case is a file transfer through a LocalTalk-to-LocalTalk router. In this configuration, which we tested with a Shiva NetBridge, file-transfer times are double those of a straight one-network LocalTalk transfer. And although Ethernet is much faster than LocalTalk, sending a file from a LocalTalk network to an Ethernet network through a router (we used a Shiva EtherGate router for this test) is *slower* than a straight LocalTalk transfer. When two LocalTalk-to-Ethernet routers are involved — a common configuration for large companies in which several LocalTalk nets are interconnected by an Ethernet backbone — things slow down even more.

The bottom line? If you're going to be moving large files around a network, design your network carefully. Avoid sending files across routers, whenever possible.

Finally, a word on compression. Compressed files, being smaller than uncompressed files, take less time to transfer. We compressed our test file with both StuffIt (which trimmed it by about 1/3) and with JPEG compression (which slashed the original file to 1/50 of its original size, although the resulting image was of lower quality because of lost data). Obviously, the JPEG files spent less time on the network.

But is it really faster to work with compressed files? Unfortunately not (see Figure 5). Using either StuffIt or JPEG software compression, it *still* takes longer to compress a file, send it over Ethernet, and then decompress it than to send the uncompressed file over LocalTalk. In short, compression may save space on your hard disk, but it probably *won't* save you time.

— Henry Bortman

• ***For animation programs such as MacroMind Director, simplify the cast members as much as you can.*** Use a single color and simple geometric forms whenever possible, and try to avoid complex full-page animations.

Revving Up Your Mac

There are plenty of hardware solutions for dealing with large files. Short of buying a new Mac, you can boost RAM; add accelerators; or buy a larger, faster drive, as follows:

• ***Build up memory.*** Make sure you have as much RAM as your Mac can hold. This is normally 4 megabytes in a Plus, SE, or Classic; 8 in a Mac II, IIx, IIcx, IIci, or SE/30; 9 in a Portable; 10 in an LC; 17 in a IIsi; and 32 in a IIfx.

Consider supplementing true RAM with a virtual-memory program such as Virtual from Connectix, which takes a contiguous multimegabyte block of space on your hard drive and treats it as an extension of the existing RAM. (Virtual requires either a 68030 microprocessor — as in the SE/30 or later Macs — or a 68020 plus a 68851 PMMU chip, which is normally sold with the software for the Macs that need it.) Some programs create their own virtual memory, and it will be built in to System 7.0, although you'll still need a 68030 chip or a 68020 plus a PMMU to take advantage of this feature.

If you have a Mac with a 68030 CPU, consider another Connectix product, Maxima. This application lets you add up to 32 megabytes of RAM in the two banks of memory slots. This is more RAM than the ROM allows, but Maxima uses the additional memory as a RAM disk into which you can load applications or files for superfast access.

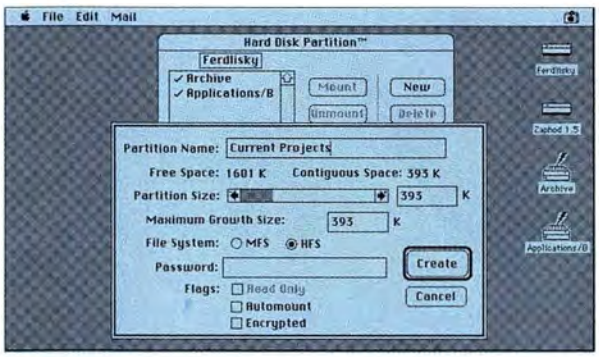


Figure 3: By partitioning your hard disk, you can streamline file organization and reduce the fragmentation of free space, which slows the Mac's performance. Here, FWB's Hard Disk Partition is being used to divide a hard disk into three separate volumes, one each for infrequently used applications, work in progress, and files to be archived.

• ***Buy a bigger, faster hard drive.*** If you regularly deal with large files, it makes sense to get the biggest hard

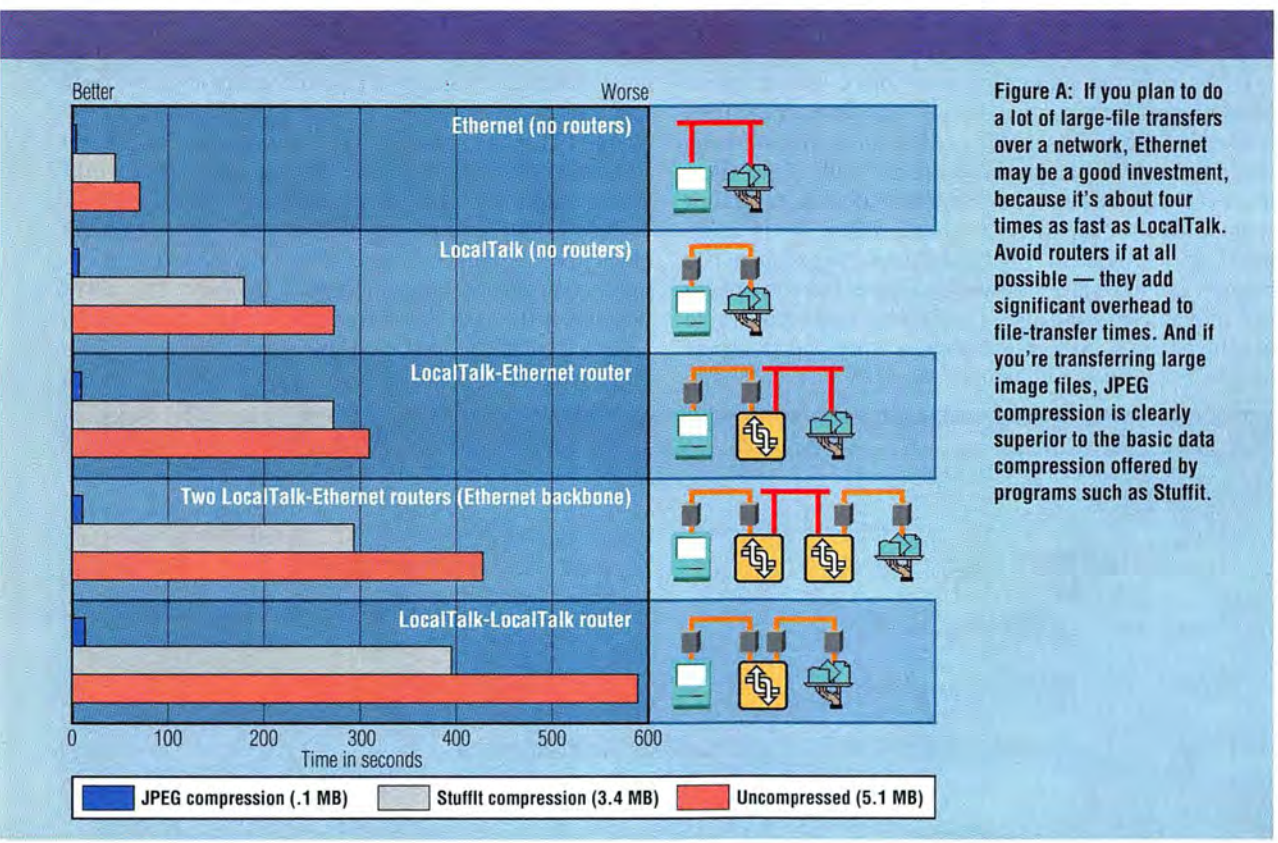


Figure A: If you plan to do a lot of large-file transfers over a network, Ethernet may be a good investment, because it's about four times as fast as LocalTalk. Avoid routers if at all possible — they add significant overhead to file-transfer times. And if you're transferring large image files, JPEG compression is clearly superior to the basic data compression offered by programs such as Stuffit.



Figure 4: To meet the memory and speed demands of prepress and other high-end work, Sixty Eight Thousand offers the dash 30fx. The heart of this $11,000 workstation is a Mac IIfx motherboard that's been souped up with a 50-megahertz clock speed and a math coprocessor, plus 8 megabytes of fast RAM and a 209-megabyte Wren V hard drive. Performance is more than 30 percent faster than that of a stock IIfx.

drive you can afford. A capacious drive lets you use partitions to organize file storage and gives you the space necessary for a virtual-RAM application. Consider replacing a modestly sized drive with a larger one or daisy-chaining a second drive to your first.

If you're in the market for a new drive, go for speed. Most manufacturers cite a drive's seek time, or the time it takes for the drive's read/write head to move from one track to another. If you're working with large files, however, data throughput — the time it takes to read or write a file's data to or from the drive — is more important. In general, big hard drives (larger than 100 megabytes) have faster throughput times than do optical or removable-media drives. On the other hand, removable cartridges are a convenient way to store and transport huge files and you can increase capacity just by buying additional cartridges. (For more information, see "Erasable Optical Drives," November '90, page 102; "Moving Up to a Big, Fast Hard Drive," December '90, page 114; and "Portable Secure Unlimited-Storage Cartridge Drives," elsewhere in this issue.)

• ***Accelerate relevant operations.*** An accelerator can speed up some operations. The CPU and various activities in your Mac, such as arithmetic operations and screen redraws, can be accelerated separately, but it's difficult to know which type of accelerator can help with the software you use. This is a particularly tough call for page-layout and graphics programs. A CPU accelerator can make some difference, because graphics programs perform a lot of behind-the-scenes calculations. To speed up screen redraw, however, try a QuickDraw accelerator such as the RasterOps Accelerator board or Apple's Display Card 8•24 GC. If your large files arise from spreadsheet, CAD, or rendering programs, a CPU accelerator with a math-coprocessor chip should speed things up. For database software, getting the fastest hard drive you can afford makes the most sense.

A cache card, which costs about $200, can increase a IIci's speed by 30 to 40 percent. It's also possible to make a Mac SE or Plus run almost as fast as a Mac IIci — without color, of course — by using a zero-wait-state "computer on a board" accelerator. (For a complete rundown on accelerator options, see "Chasing the IIfx: Accelerators," August '90, page 84, and "SCSI Accelerators," March '90, page 175.)

• ***Buy a souped-up Mac.*** If you have really heavy-duty needs for capacity and speed and the strategies previously mentioned aren't sufficient, consider buying a supercharged Mac from a third party. For example, Sixty Eight Thousand offers the dash 30fx, an accelerated Mac workstation built around a IIfx motherboard (see Figure 4). The $11,000 base configuration has a 50-megahertz clock speed, math coprocessor, and 8 megabytes of 70-nanosecond RAM (expandable to 32 megabytes) — all of which help the dash 30fx run at least 30 percent faster than a stock IIfx. The workstation comes standard with a 209-megabyte Wren V hard drive, but if that's *still* not enough

Figure 5: Does File Compression Save You Time?

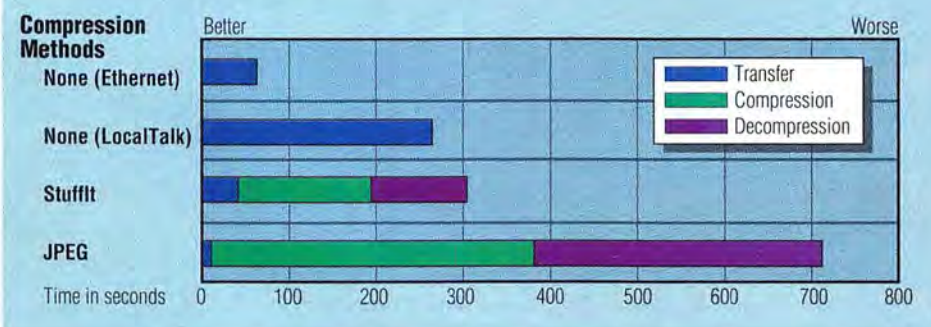


Figure 5: Because they're smaller, compressed files take less time to transfer across a network. But it's *still* faster to send a file uncompressed — even over LocalTalk — than it is to compress it, send it across Ethernet, and then decompress it.

storage, you can increase the internal capacity by up to a whopping 10 gigabytes.

The Big Squeeze

You can solve some of your big-file problems by compressing files for transmission or storage. *Compression* is a general term for processes that make files smaller by eliminating redundant information. Functionally, compression schemes fall into two broad categories: general data compression, which reduces the size of virtually any file, and application-specific compression, which is designed to compress a particular type of file (such as images, video, or sound). Some compression schemes preserve all data, so when the file is decompressed, it is identical to the original (this is known as lossless compression). Other schemes strategically discard information so that the decompressed file is usable but different from the original (known as lossy compression). Not surprisingly, lossy-compression methods tend to compress files to a smaller percentage of their original size than do lossless schemes.

Compressing and decompressing large files can be a time-intensive process. This isn't an important consideration if you're compressing files for archival purposes, because you won't be accessing them frequently. If you're compressing files to send over a network, however, it may be more productive — for you and your coworkers — to send uncompressed files than to compress them, send them, and then decompress them (see Figure 5). If you're sending files by modem, it makes sense to compress them first, because you want to keep expensive on-line time to a minimum.

General compression utilities have been around since the Mac's early days. StuffIt Classic (a shareware program) has been the de facto standard for several years, but StuffIt Deluxe (a commercial version of StuffIt) (see Figure 5), DiskDoubler, and Compactor (also shareware) are gaining popularity. (*MacUser*'s on-line service, Zmac, uses Compactor.) UnStuffIt and other utilities for decompressing files are freely available through bulletin boards, on-line services, and user groups. Most of the available compression schemes are reliable, although it makes sense to preserve a decompressed copy of any critical file until you're sure you no longer need it.

How much one of these general utilities compresses your files depends a lot on what kind of file it is. TIFF files, for example, are very "fluffy" and can often be compressed by as much as 90 percent. Files that contain executable code — such as applications, INITs, or cdevs — compress much less, sometimes by only 20 percent. Virtually all compressed files must be decompressed for editing, output, or other use, although sometimes this process is handled automatically.

There are specialized compression methods for particular types of files, such as audio and graphics, that offer dramatically high rates of compression. This economy

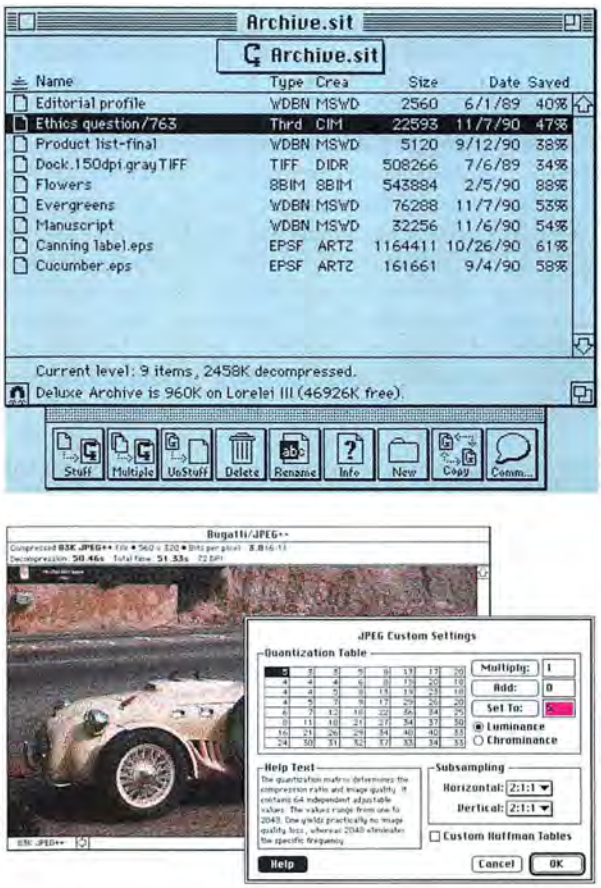


Figure 6: To shrink monster files down to size, consider using a compression program. StuffIt Deluxe (top) is a general-purpose utility that also offers JPEG compression for Photoshop files. Storm Technology's PicturePress (bottom) uses JPEG compression to reduce image files to a fraction of their original size. The software can be used by itself, or for greater speed, it can be combined with the PicturePress Accelerator board. PicturePress also includes a scheme called JPEG++, which lets you select important areas of an image and compress them less (retaining more data) than the rest of the image.

may come at a price, however: If you opt for maximum compression — say, a 40:1 ratio — perceptible data may be removed. On the positive side, changes may be subtle and you may not care unless you're doing very high-end work.

Image compression is a rapidly growing market, with several new packages having been introduced during the latter half of 1990. Several are designed to comply with the draft JPEG (Joint Photographic Expert Group) standard, a scheme for compressing 24-bit-color files that is expected to be adopted later this year. The main advantage of the JPEG standard is portability — a fully JPEG-compliant application should be able to decompress any JPEG file, regardless of source. If JPEG ever settles down to this idyllic state, it should be a useful standard.

JPEG-standard compression can be handled in software alone or with an assist from hardware, which tends to be much faster (see Figure 6). (As of this writing, Radius has announced a software-only utility, code-named Piculator, that it claims will be considerably faster than its hardware-based competitors.) Among the JPEG-based compression packages are Kodak's Colorsqueeze (software), Storm Technology's PicturePress (a hardware/software combination), and C-Cube Microsystems' CompressionMaster board. C-Cube's compression chip also forms the backbone of SuperMac's SuperSqueeze and Neotech's Image Compressor (marketed by Advent Computer Products in the U.S.). StuffIt Deluxe also uses JPEG to compress 24-bit-color files.

Not all products for image compression are JPEG-compliant, however. Maple Picture Publisher (marketed by Essex Partners in the U.S.) works only with monochrome or gray-scale images. Unlike JPEG products, Maple files decompress automatically on output, so users need not deal with the mechanics of decompression.

Also available are special compression programs for sound, including SoundEdit (part of Farallon's MacRecorder package) and Digidesign's Sound Tools. In addition, a compression scheme for video called MPEG (Motion Picture Expert Group) is in the works and SuperMac has announced a compression product for live video.

Getting It On-Line

When you send large files over a modem, the most direct approach is to compress all files as much as possible and use the fastest modem available. Two years

Figure 7: The Best Network for Big Files

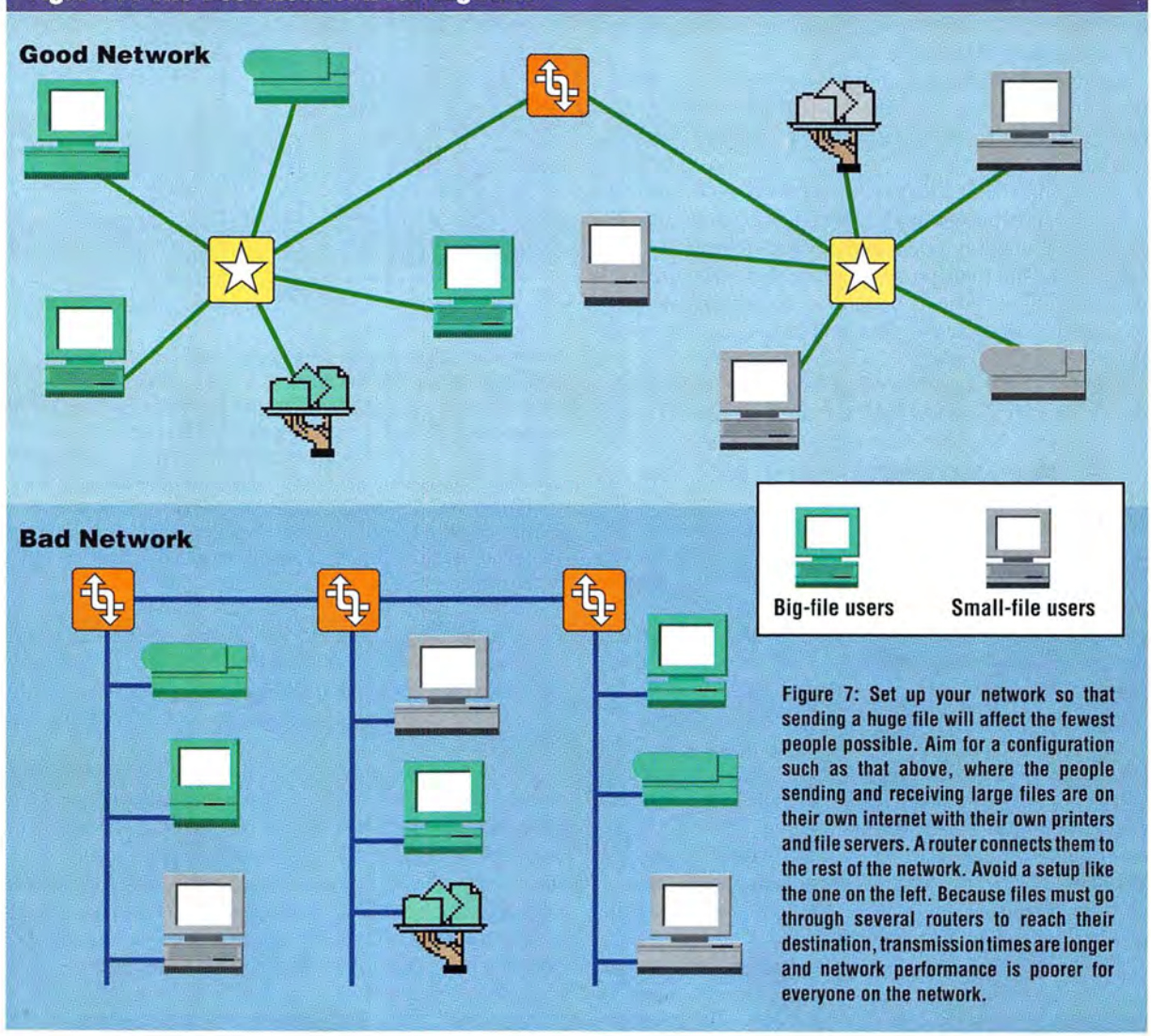


Figure 7: Set up your network so that sending a huge file will affect the fewest people possible. Aim for a configuration such as that above, where the people sending and receiving large files are on their own internet with their own printers and file servers. A router connects them to the rest of the network. Avoid a setup like the one on the left. Because files must go through several routers to reach their destination, transmission times are longer and network performance is poorer for everyone on the network.



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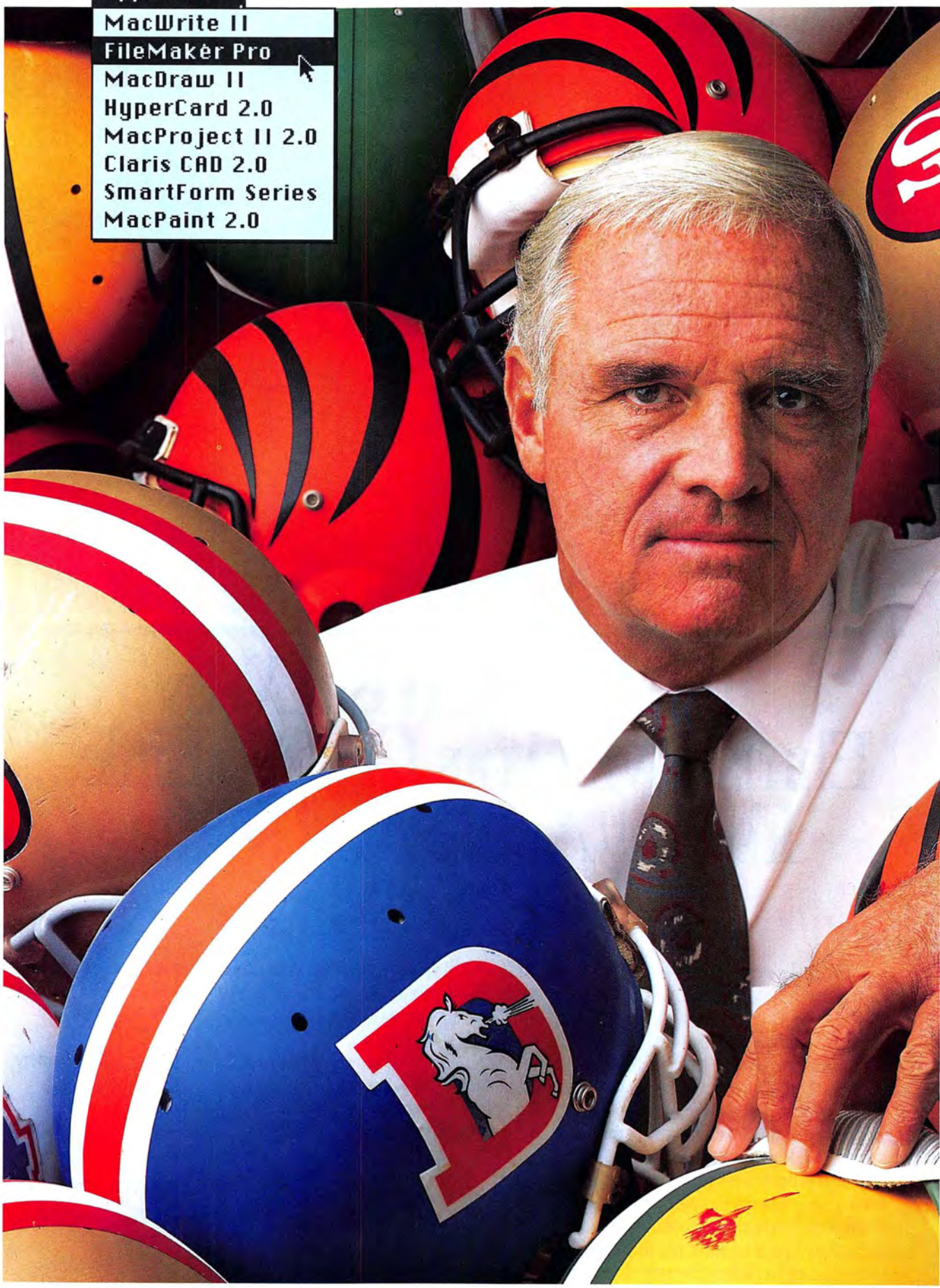
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Too Big to Fit on a Floppy?

ago, a truly fast modem transferred data at 2,400 bps, but today there are reliable 9,600-bps units as well as a few 19,200-bps units for use with ordinary phone lines. (For more on superfast modems, see "Modems: 9,600 bps and Counting," January '90, page 180.)

When sending big files over a modem, you should consider which error-correction and data-compression techniques you want to use as well as which transmission protocol works best with your modem. Today most modems have adopted MNP Class 4 as an error-checking and -correction standard and either MNP Class 5 or V.42bis as a data-compression standard. MacUser Labs recently looked at 2,400-bps modems and determined that the V.42bis compression scheme outperformed MNP 5 (see "Thoroughly Modern Modems," January '91, page 100). For very compressible files (such as text and TIFF), V.42bis delivered a 4:1 compression ratio whereas MNP 5 achieved only 2:1 compression. Even more important when you're sending large files, V.42bis can recognize files that have already been compressed with a utility such as StuffIt and, unlike MNP 5, won't waste time trying to recompress these files.

When you're transmitting huge files, the protocol you use can affect transmission speed. The most popular protocol is Xmodem, in which the sending computer sends a block of data and then waits while the receiving computer checks it for errors and then transmits an acknowledgment (or "handshake"). If your modem has built-in error checking, this will really slow it down. You're much better off using Zmodem, a protocol that bases the number of acknowledgments required on the number of errors detected. In other words, if your transmission is sailing right through, Zmodem won't bog down the throughput with unnecessary handshaking.

Compressing huge files before transmitting them has its own problems. Compressing and decompressing a huge file can take a long time, and some service-bureau operators are beginning to balk at the time required to decompress documents before outputting them. If you're charged a fee for decompression time and if the bureau has the necessary hardware, send your files on a removable cartridge.

Network Strategies

If you're going to pass multimegabyte files over a network, there are several things you can do to avoid bringing the network to its knees:

- Use a router to isolate the group of people who will be passing the big files from the rest of the office (see Figure 7). In effect, adding a router creates a separate network. It allows communication among networks but prevents the huge file you are printing or copying on your network from slowing down everyone on the internet.
- If you are on a big internet with many routers, be sure that you place file servers and printers with the work group that is using them. Moving a big file through a

router takes time, and the more routers you have to go through, the longer it takes to move the file.

• Put heavy-use work groups on Ethernet or token ring, which handles the increased traffic generated by large files better than LocalTalk does (see the "SneakerNet or Ethernet?" sidebar). This approach requires you to purchase the appropriate card for each Mac. Expect to pay anywhere from $400 to $1,000 per Mac, but you have to buy cards only for the heavy-use work group — the rest of the office (on the other side of the router) can remain on LocalTalk. (For the best in Ethernet cards, see "Are You Ready for Ethernet?" Buyer's Guide, June '90, page 20.)

• When setting up your internet, consider an active-star topology. This setup uses a star controller at the hub of the internet, with individual networks connecting to it radially. Active-star topologies are popular, because they are easy to set up and alter. They increase the efficiency of your network by boosting network signals and guaranteeing that files reach their destinations. For optimal performance, make certain you use only one Macintosh for each port of the star hub if you are moving monster files.

• If your LocalTalk wiring scheme uses telephone cabling, you may be able to use the same wiring for Ethernet. In this case, make sure that the Ethernet cards and connectors you buy are compatible with 10BASE-T (the Ethernet standard that runs on phone wires). Similarly, any active-star hubs must also be 10BASE-T-compatible.

The Big Picture

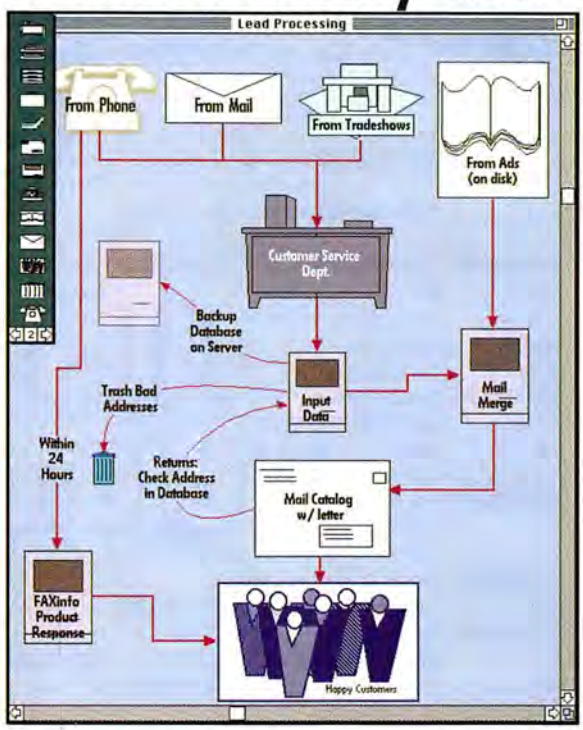
It's clear that file sizes are not diminishing — far from it — but the products and solutions described here will hold the flood in check until the Mac catches up. Two important developments — System 7.0 and new, even faster Macs based on the 68040 chip — will undoubtedly let us build even larger files, and they'll also give us the tools to deal with them.

System 7.0 will let you put more RAM into your Mac (although some older models may not be able to take advantage of this), and it will incorporate new Finder tools that will make managing many and large files easier. The 68040 CPU will operate much faster than today's microprocessors, speeding up such operations as screen redraw and opening and saving files.

These enhancements won't be in place and fully operational for several months to a year, and even then they won't solve all the problems associated with large files. In the meantime, your best bet is to make sure you and your Mac have everything it takes to manage monster files.

Contributing editor Kathleen Tinkel is a Connecticut-based graphic designer who writes frequently about computers and design. She is copublisher of *MacPrePress*, a weekly faxed newsletter.

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By Aileen Abernathy

Type trends: Among typeface vendors, the current rage is to put an entire font library onto a CD-ROM disc. The catch: You can access only a few fonts when you first purchase the library. The rest of the collection is locked safely away. The customer advantage: Instant gratification. If you need a new font, you don't have to order it and await delivery. You simply call a toll-free number, ante up a credit-card number, and receive the code for unlocking the font. ✱ Image Club Graphics pioneered this approach with Art & Type Vendor, a CD-ROM disc containing 600 fonts and 20 volumes of clip art. For the initial $99, you get 20 fonts and one clip-art collection. ✱ However, version 2.0 of Agfa Compugraphic's CD-ROM disc gets my vote. For $975, you get the AgfaType disc (with 20 unlocked, user-selected fonts) *and* a Toshiba CD-ROM drive. Tucked away on the disc are 1,152 more PostScript typefaces — the entire Adobe Type 1 library and all of Agfa Compugraphic's Type 1 and Type 3 faces — plus five type-related programs: MasterJuggler, Art Importer, Metamorphosis, TypeStyler, and LetraStudio.



Missed opportunity? Silicon Beach's highly touted Personal Press was expected to define the low end of the page-layout market. Now Personal Press is almost a year behind schedule (the revised ship date was December 1990), and many of its once-innovative features have found their way into competitors' programs. ✱ Meanwhile Timeworks — formerly a dark horse — has shipped *two* versions of Publish It! Easy. Don't let pronunciation of the name fool you — this is a classy product. Version 2.0 retains the simple interface and clever innovations of its predecessor, such as interactive "libraries," while adding a truckload of new features such as slide-show capability and a service-bureau checklist. It still lacks some typographic niceties, but Publish It! Easy 2.0 remains compact and runs (quickly) on the low-end Macs.

Brøderbund listens to its customers. The proof: TypeStyler 1.5 eliminates most of the original version's shortcomings, offering faster screen redraws, improved screen WYSIWYG, new character-shape options, and support for "family built" fonts. At $200, TypeStyler is the program of choice for creating special effects with type. ✱ Looking for illustrations that cover environmental issues, the Middle East conflict, or German reunification? Check out Agenda for the Nineties, one of seven new clip-art offerings from FM Waves. This San Francisco-based company markets 300-dpi TIFF images on topics ranging from traditional (business cartoons, animals) to the offbeat (fashion, fantasy). $144 per package or $499 on CD-ROM disc.





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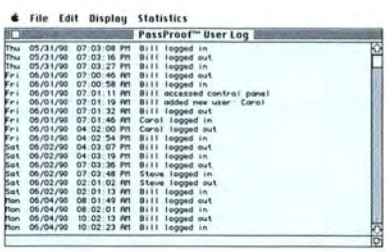


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True Grid

One designer shares some of his secrets for creating great grids — the backbone of a page's design and structure.

By Steve McKinstry

When you look at this page, you can't see the grid it's built on, but the grid is there, invisibly organizing the words and graphics. If you removed the grid, the page might not collapse into a rubble of words, but your eyes would certainly be in for a bumpier ride.

A *page grid* is an underlying structure of nonprinting guidelines that helps anchor elements such as text, pictures, sidebars, and folios. The grid provides a framework for the page design, and like the smooth layout of a highway system, it defines the best transportation routes for reading a page. There are fast lanes for information you should go to first (headlines and blurbs), slower lanes for reading and retaining complex information (the main text), and easy on and off ramps for utility items (charts and captions). To help you navigate, a grid positions colorful signals such as section headings. There are also white spaces that, like a green belt, keep a page looking less congested and help avoid head-on collisions between text and graphics.

Production departments used to create grids by hand, using calibrated rulers and engraving tools that inscribed grid lines onto a master film negative. The grid was then printed on sheets that served as a link between the designer's rough sketches of the layout and the composing room's paste-up boards. Now you can create a grid electronically, but as most page-layout programs don't produce grids automatically, you still have to do it from scratch. When designing a grid, you should carefully consider its two basic functions: design and utility.

Design Considerations

Designing a grid for your publication goes beyond choosing the column numbers and margin widths in a page-layout program. Grids must reflect the pace and style of the information you publish. Depending on the number of columns, column width, and amount of white space, a grid can convey an attitude that is rigid or playful, airy or tight, elegant or workmanlike, energetic or calming. When designing your master grid, follow these simple rules for page design:

• Vary the number of columns. Let's say you're publishing a newsletter. You could set up a simple three-column grid with equal margins, but that would confine the text to a linear flow, forcing headlines, bylines, body text, and captions to stack on top of each other. This makes it harder for the reader to find the meat on the page, because all of the page's



Figure 1: Perhaps no publication experimented with changing its grids as much as *Aldus Magazine* did during its first year of publication. The magazine's art director, Scott Campbell, created a different theme-based grid for each of the first six issues (the March/April 1990 issue is shown here).

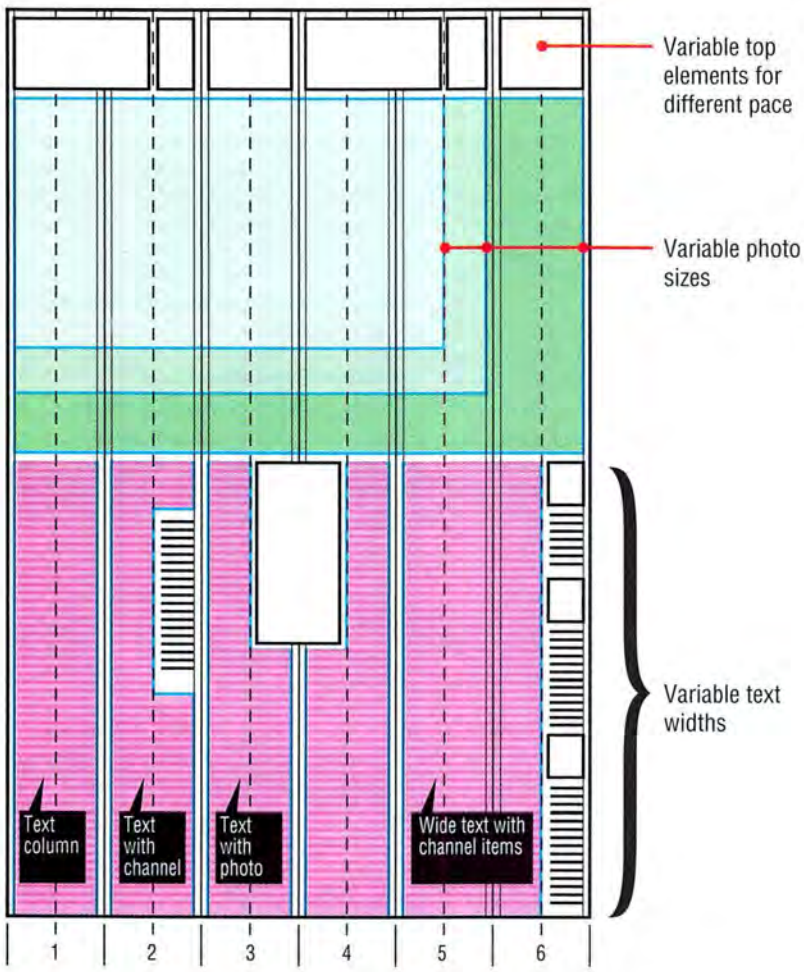


Figure 2: This sample newspaper grid is based on a traditional 6-column format that has been split into a 12-column substructure to accommodate variable text widths and photo sizes. Single-column channels of information in larger point sizes encapsulate a story's main elements for people with limited reading time. These channels are placed next to the multicolumn body text and don't obstruct the reading flow. The 12-column grid also allows for a multicolumn, fast-paced top index.

elements have equal weight and it limits the number of graphic shapes you can use.

Instead, set up your grid with an underlying structure of multiple columns, which provides more choices for sizing text and graphic elements. If you create a newsletter grid with 6 columns instead of 3, you can flow text into 3 narrow columns or 2 wider ones, and you have six options for graphics widths, rather than a mere three. Or consider a newspaper, which typically has 5 or 6 columns. Creating an underlying grid structure of 10 or 12 columns gives you much more flexibility with column numbers and widths (see Figure 2). You can even have columns that serve as special channels for quotes, photos, or news summaries.

An even number of columns, such as a 12-column format, promotes a symmetrical design — that is, the page's weight is positioned equally from side to side. An odd number of columns (say, 11) lets you alternate page weight from side to side, such as placing a 5-column element next to a 6-column one.

• Use uneven column widths. Many publication designers build a narrower column into their grids that can be positioned between or outside 2 larger columns. This skinny column is reserved for small art, subheads, quotes, captions, or secondary sidebars (see Figure 3).

• Try using multiple grids on the same page. You can vary both the number of columns and their widths in different areas of the page. For example, a software manual might have a text column straddled by a thin column on one side for quick tips and a slightly larger column on the other side for fleshing out examples (see Figure 3). Or a magazine might split the page horizontally, using the top for a standard 3-column text format and the bottom for a 9-column format of easy-to-read calendar information.

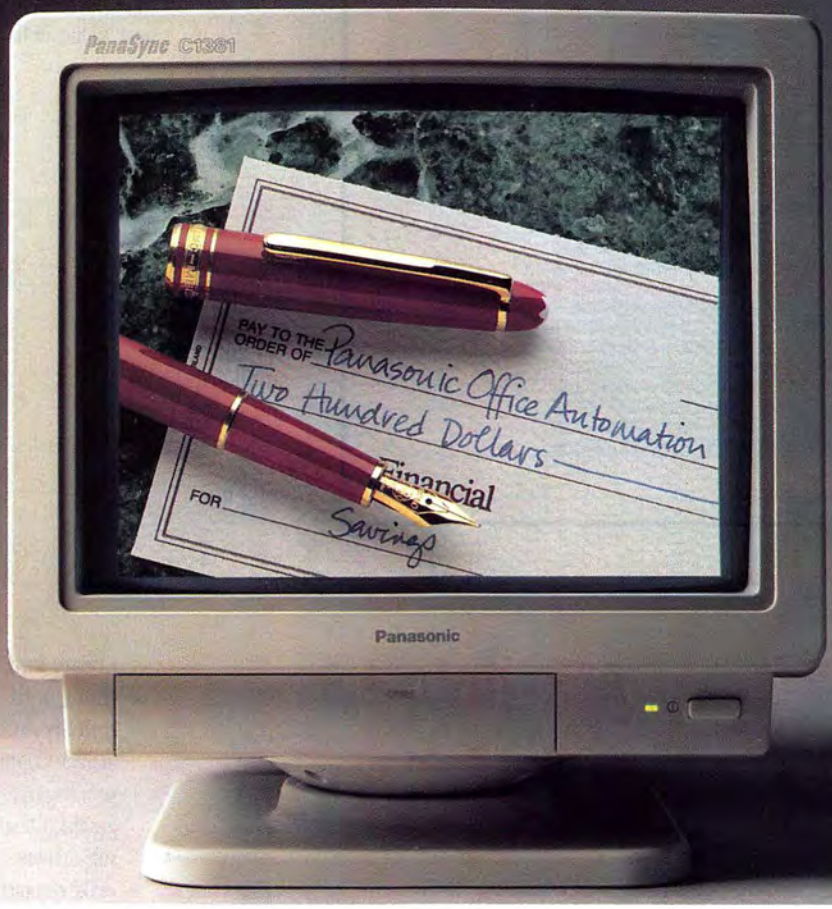
• Include white space. If you're concentrating intently on something, every once in a while you need to take a break and look around. The same is true of your eyes while you read. You should design white space (empty space, sometimes called negative space) into your grid, not only to enhance the design structure but also to provide a tool that can separate and buffer information and focus the reader's eyes on individual elements.

Use white space with discretion, however — when poorly handled, it can be a distraction. White space is most effective when it interacts subtly with the text and graphic elements (positive space) on the page. In general, white space works best when it's placed at the outer edges of a grid. White space that is noticeably bounded, or trapped, by other page elements becomes as much of an eyesore as an overcrowded page.

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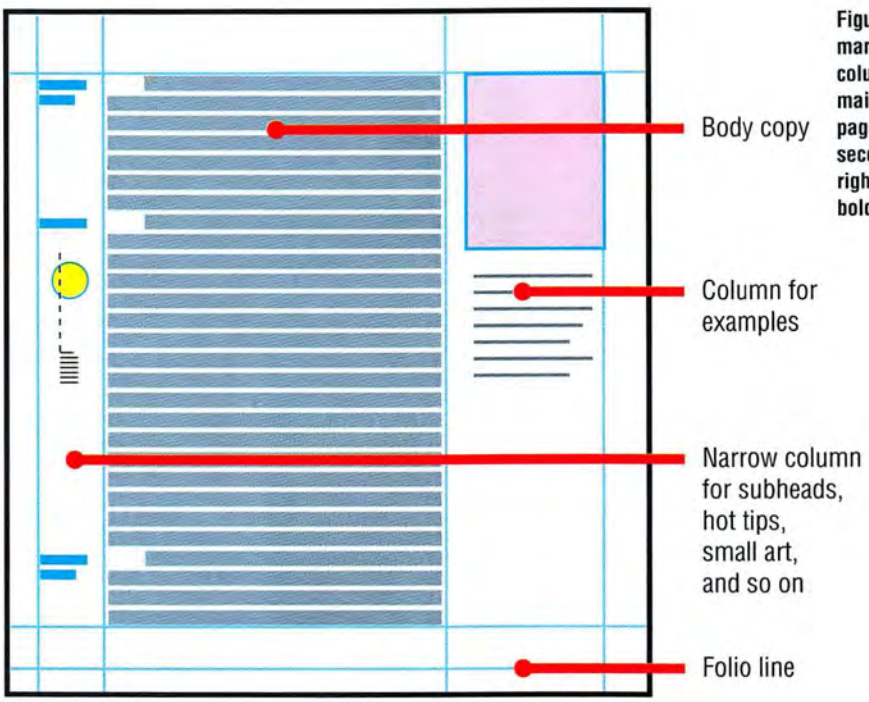
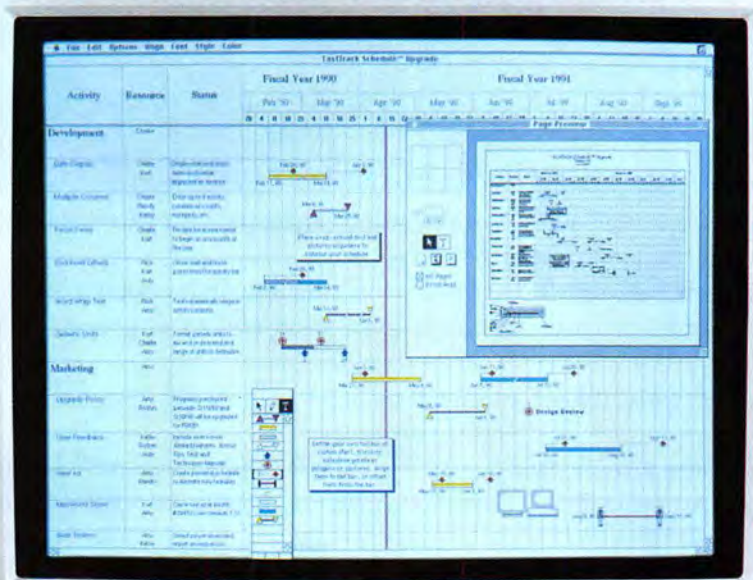


Figure 3: This sample grid for a software manual makes use of variable-width columns to create information channels. The main text flows down the middle of the page, while clarifications, warnings, and secondary information run on the left and/or right sides. Text within the channels can be bold, color, or italic for a change of pace.

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even the best designer is caught in gridlock. Some designers live and die by their hairline rules; others let themselves break the grid when necessary. It's a good idea to design flexibility into your grid so that you can do such things as tilt and rotate text or graphics. Such novelties can act like a splash of cold water on readers and renew their interest in what's happening on the page. Don't break the grid too often, however, or this exception-to-the-rule technique will lose its impact.

• Bleed art elements. A mime can make you believe the air has walls. People tend to think of grids in the same way — as invisible but rigid horizontal and vertical confinements of space. To add a little spontaneity to your pages, occasionally bleed art elements off the page to make them look substantially larger than they actually are.

• Plan your folios. Design your magazine with utility in mind, and place the folios (page numbers, issue date, publication name) so readers can easily find the articles and art. Analyze how a reader holds and scans the publication in order to determine the eye level at which information is first seen. Begin with the cover and table of contents to establish consistent and prominent placement for section and department heads. The issue date and publication name can be placed in secondary positions.

The Production Side

The second part of building a grid is making sure that it offers consistent placement of text, graphics, and utility functions such as registration and trim marks. You can use the master pages in your page-layout program to create a master grid that will be the building block for all subsequent page templates. It's important to set up your publication's master grids correctly from the beginning — if there's a mistake in the master grid, every template in your publication will need revising. For example, a folio incorrectly placed on the master page will be wrong on every page built from that master page. Here are a few production considerations to keep in mind when constructing grids:

• You'll need to construct grids for right- and left-hand pages and perhaps for spreads (depending on your page-layout program) as well. In QuarkXPress 3.0, for example, you need create only right and left master grids to produce a spread that can be printed to film, because QuarkXPress lets you write a PostScript file to disk for two pages side by side. (Using two single pages in QuarkXPress is preferable to using facing pages, because it avoids having a single right-hand page at the top of the Document Manager.) In PageMaker, however, you must create a spread grid as well as left and right grids if you want to print a spread to film.

• Construct the grid from a fixed zero point so that you always have an absolute reference point for positioning elements on the page. This is important if you're sending documents to a high-end prepress system such as a Crosfield or a Scitex, which positions all page elements based on a fixed zero point. QuarkXPress 3.0 offers this sort of precision grid building. You can select a text or picture box and use the Modify dialog box to enter its *x* (origin across) and *y* (origin down) coordinates

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from the zero point. This establishes where the left and top sides of the object begin. Entering the width (second *x* coordinate) and height (second *y* coordinate) establishes the object's right and bottom sides. This method is more accurate than positioning elements by eye, which is what you must do in PageMaker.

• Use vertical and horizontal guides that pull out from the rulers to create nonprinting guidelines to which you can snap elements. With these nonprinting guides, you can define boundaries for image and text areas, bleeds, folds, and trims.

• If you work in QuarkXPress, use the Preferences dialog box to default all text and graphic frames in your grid to No Fill and No Wraparound. This keeps the grid lines visible when you position text and graphics.

• View the page at 400 percent to achieve the best precision when you're placing elements.

• Group and lock all page elements to ensure that they aren't accidentally moved out of position. (PageMaker doesn't let you do this.)

• When you're electronically re-creating a grid for an existing publication, it's best to first create a test grid, using hairline rules, and output it to positive film. Lay it over your existing grid sheet to check for misalignment.

The Lowdown on the High End

If you're sending work to a high-end prepress system, be sure your grid is compatible with the prepress setup. For example, you can choose to set your page-layout program to automatically produce registration and trim marks when you're printing to an imagesetter, but if you use a prepress system such as Crosfield's StudioLink, you'll have to create the marks manually on the grid itself. If you use this type of system, be sure that the page size is slightly larger than the maximum bleed area to make room for your registration, bleed, trim, and calibration marks.

Here are some other grid-construction tips to consider when outputting to a prepress system:

• Create registration, bleed, and trim marks in 100 percent of cyan, magenta, yellow, and black so that they'll separate and print on each plate.

• Place CMYK calibration strips containing screened tints in 10-percent increments for each color in the page margins. This precaution enables the prepress bureau to check the color density of the final film to ensure that it matches the specifications of the original document.

• Prepress systems use the metric system for determining the trimmed page size, so you too should use metrics to measure page size and to create trim and bleed coordinates. Inside the page margins, however, you can safely use points and picas to measure text and image areas. A note of caution: Many prepress systems use a measuring system of 72.27 points per inch, whereas most page-layout programs count 72 points per inch. If this level of accuracy is important to you, talk to the staff at your prepress bureau about dealing with this discrepancy. It may be possible to make adjustments at the prepress end — by adjusting the leading in an Atex system to match the Macintosh grid, for example.

Measuring Options

Your grid should make it easy to measure and place elements on the page. Here are a couple of tips that will help you get around the rigid measuring options in most page-layout programs:

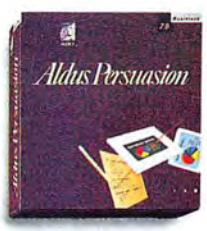
• Many publications measure the length of text in leaded lines of type, not in picas or points. Some page-layout programs let you change the vertical ruler's numbering and tick marks to match your grid lines. In PageMaker, for example, you can use the Preferences dialog box to define the incremental ruler breaks on the vertical ruler at any point size you wish.

• If the fixed horizontal and vertical rulers are too inflexible for your needs, you can create a second set of rulers that you can move around the grid and view from anywhere on the page. To make a simple text ruler, create a text element containing a vertical line of numbers that equals the maximum number of text lines on a page and that is leaded the same as your body text. By formatting these numbers in underline style, you can line them up with the guidelines. In QuarkXPress, to prevent the rulers from being printed, you can suppress printing of the text frame by using the Modify dialog box; in PageMaker, you can leave the makeshift rulers on the pasteboard.

Grids are the best way to establish a set of design and production guidelines that everyone at a publication can follow. Designing an accurate grid that effectively conveys your publication's message requires the collaboration of designer and editor so it can effectively eliminate inconsistency and chaos and help your readers reach their (and your) intended destination.



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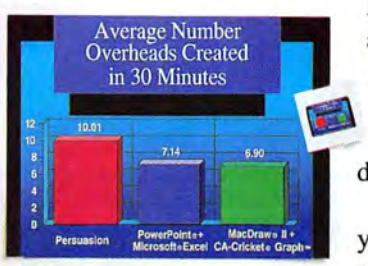


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A Fruitful Use of Blends

Using PostScript blends, you can create objects with smoothly blended colors and a realistic appearance.

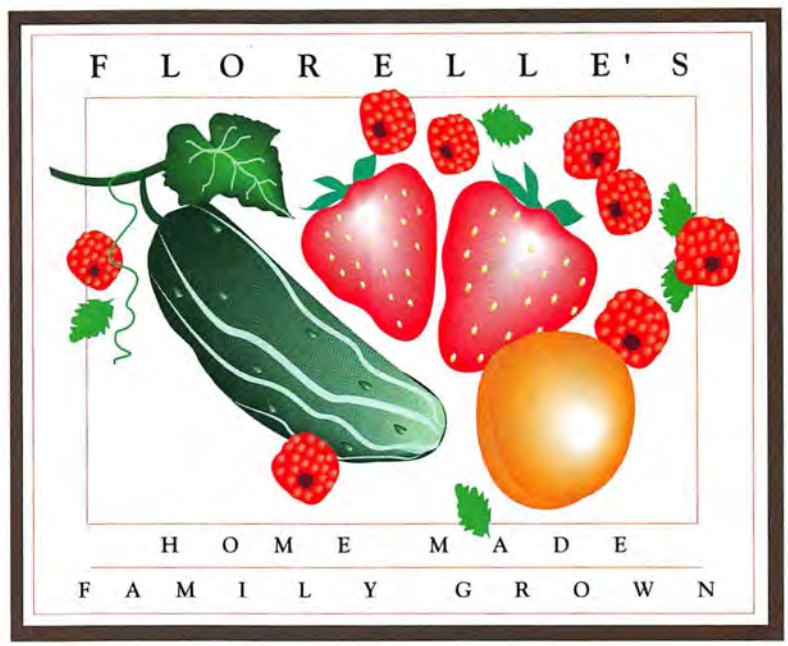
By the editors of *Verbum* magazine

One powerful feature of a PostScript illustration program is its ability to create graduated fills and blends automatically. In FreeHand you can create graduated fills quickly from minimal specifications. Unfortunately, simple graduated fills don't work when you need to match the blend to an irregular shape. In such cases, *shape blending* offers you greater flexibility and increased realism.

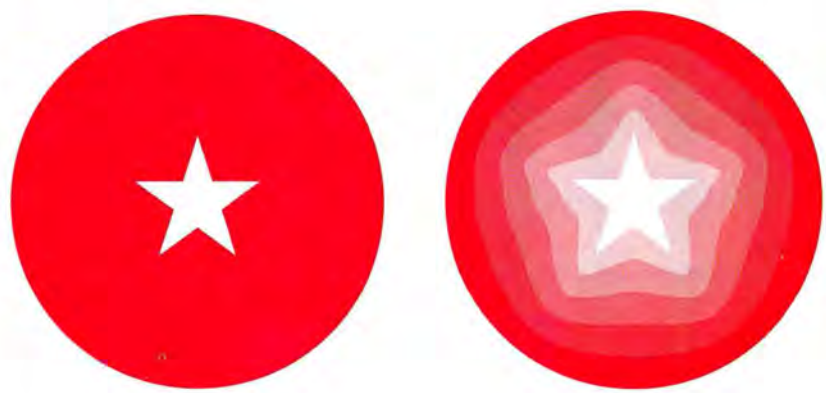
Both Illustrator and FreeHand can turn the color and contours of one object into those of another by automatically generating a series of intermediary steps. You can specify the number of these in-between steps (up to a limit of 256), which vary, depending on the size of the objects, the output resolution, and the smoothness of the blend.

Blends are used most often to create the subtle shading that gives the illusion of volume and three-dimensionality to flat art. For example, Dorothy Remington, a designer/illustrator with Remington Design in San Francisco, used Illustrator's blend function to create rounded shapes and highlighted effects for the fruit illustrations in a canning label.

Verbum: The Journal of Personal Computer Aesthetics **can be reached at Box 15439, San Diego, CA 92115.**



1 Shape Blends



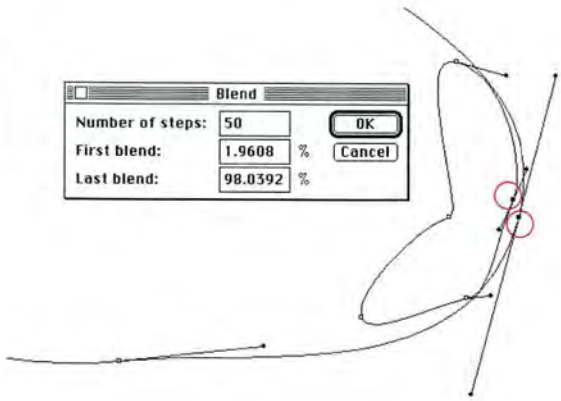
A PostScript program creates a shape blend by averaging the contours and colors of two objects across a user-specified number of steps. Any two objects can be blended, no matter how dissimilar they are. Here, a white star is blended to a red circle in four steps.

2 Creating the Basic Shapes



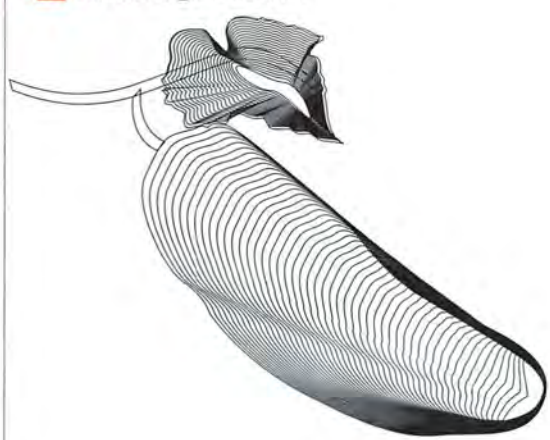
To produce a realistic-looking cucumber, Remington first draws the outlines of the cucumber, leaf, and stem and fills them with solid shades of green. Small shapes filled with lighter shades of green are drawn and positioned near the center of the leaf and at the bottom of the cucumber.

3 Selecting Reference Points



All the objects are ungrouped, and one point on each is selected. These will become the beginning and end points for the blend. The selected points (circled) are clicked on with the blend tool, and the desired number of steps is entered in the Blend dialog box.

4 Executing the Blend



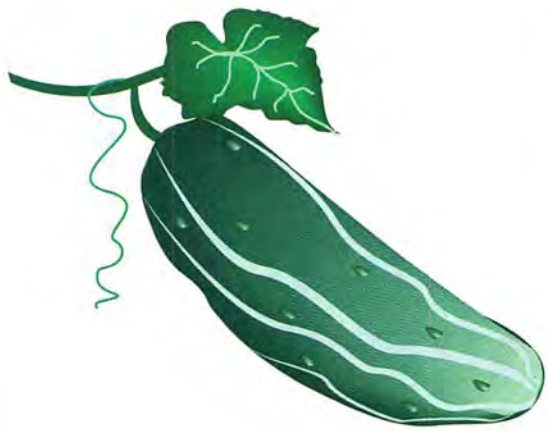
Remington chooses 50 steps for the blend between the inner and outer shapes of the cucumber and 20 steps for the leaf blend. Once executed, the steps are shown on-screen as black outlines in Illustrator's Artwork Only mode. The steps are created as a grouped object, but they can be ungrouped and edited individually for special effects.

5 The Completed Blend



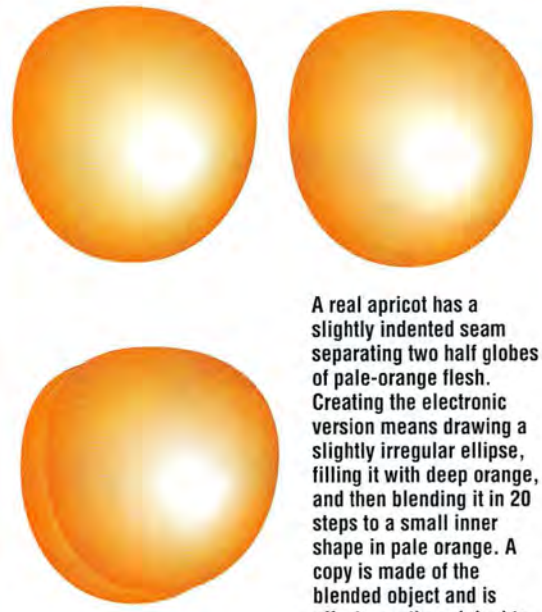
Seen in Preview mode, the finished blends give an immediate sense of volume to the fruit and leaf. Achieving the desired effect depends on careful positioning of the inner shapes and selection of the best reference points.

6 Adding Details



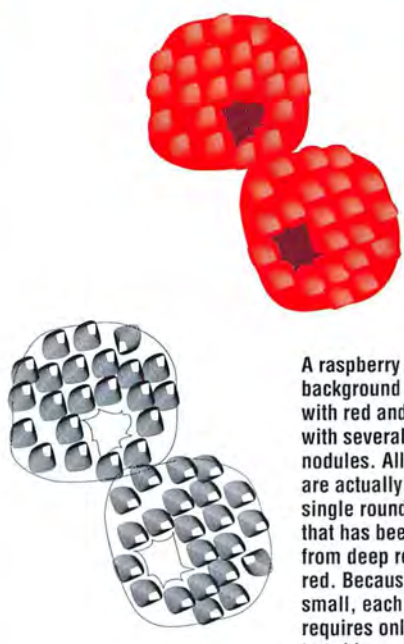
The completed cucumber sports a tendril, veins, and stripes. It also has several small teardrop-shaped irregularities that are themselves blended shapes. Note that shape blends can create large files, depending on the number of intermediate steps — this cucumber fills 159K of disk space. (Blends can also increase screen-redraw and printing times.)

7 Creating an Apricot



A real apricot has a slightly indented seam separating two half globes of pale-orange flesh. Creating the electronic version means drawing a slightly irregular ellipse, filling it with deep orange, and then blending it in 20 steps to a small inner shape in pale orange. A copy is made of the blended object and is offset over the original to reproduce the indented look of the real fruit.

8 Blending Raspberries



A raspberry comprises a background shape filled with red and overlaid with several blended nodules. All the nodules are actually copies of a single round element that has been blended from deep red to pale red. Because it is so small, each nodule requires only ten steps to achieve a smooth highlighted look.

9 The Finished Fruit



The completed illustration displays an effective use of blends to produce subtly graduated shapes with a 3-D look. This realism comes at a price, however; the final image, with all its blends, occupies 1,140K of disk space. To produce the finished canning label, Remington imported the illustration into PageMaker and combined it with type and a border (see opening artwork).



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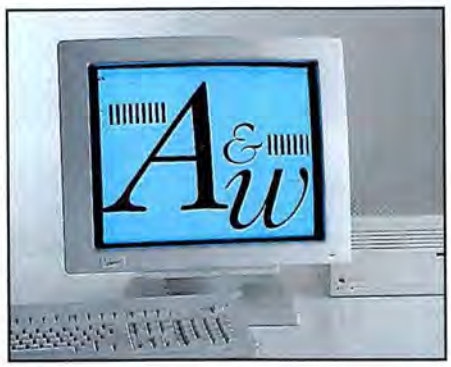
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AE DataLink Express 2400 External	$169
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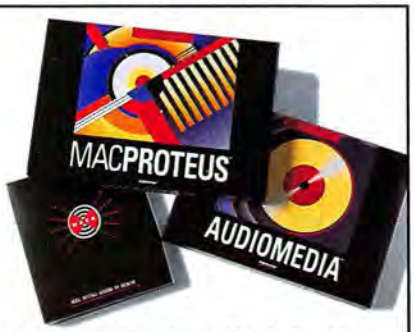
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IIfx too slow? Try Torque's i860-based ComputeServer, designed for ultrafast parallel processing, when you need to pulverize numbers, not just crunch them. Although it runs special versions of applications such as Mathematica and Dimensions RayTrace, Mac users see standard application interfaces — but they get Cray-like performance. Prices start around $19K and go much higher.

By Henry Bortman

Ethernews: Seems like every time you turn around, there's a new Mac Ethernet card. Notable among the new releases are offerings from NRC, Dayna, and Asanté. NRC has chopped another $100 off the rock-bottom cost of Mac Ethernetworking: Its Mac1000 32-bit NuBus Ethernet cards are selling for — read my lips — $295. I've seen power lunches that cost more than that — per seat.



NuBus only, one interface only — but you can choose AUI, thinnet, or 10BASE-T. ✹ Meanwhile, Dayna is offering the only internal Ethernet solution for the Mac LC (at least until Apple reveals its spoken-of-but-not-yet-announced LC Ethernet product). The DaynaPORT E/LC ($489) plugs in to the LC's PDS (processor direct slot). It sports the new National Semiconductor 32-bit SONIC Ethernet controller chip and has a socket for an FPU coprocessor. ✹ Asanté has come out with the world's smallest Mac Ethernet adapter. It has to be small to plug directly in to the Mac IIsi's expansion slot — which it does. No SE/30 or NuBus adapter is required, although you will need an SE/30 adapter if you want an FPU. The MacCon+ 30i ($495) contains an AUI port plus a thinnet or 10BASE-T port. Should be a screamer, if you're the type who likes to scream.



Weighing in: Still waiting for a truly portable Mac? Don't hold your breath; you'll turn blue. In fact, blue is where you'll need to turn. The market for lightweight DOS computers is heating up. ZEOS has just announced a 286-based notebook computer that weighs less than seven pounds and has 1 megabyte of RAM, a VGA display, a 20-megabyte hard disk, and a 1.44-megabyte floppy-disk drive: $1,995.

Yet another SneakerNet competitor: Caravelle Networks' FileShare (that should raise an eyebrow or two in the Apple Official-Names-of-Things Department) and TextPhone are DAs that offer point-to-point file sharing and text conferencing, respectively, over AppleTalk. They come bundled in Caravelle's Mac-to-Mac product. Five users, $250; 10 users, $350; 50- and 100-user discounts are also available.

UNIX without A/UX? It *can* happen here. In fact, with Tenon's MachTen, you can run Berkeley 4.3BSD UNIX, complete with TCP/IP and NFS support, on any Macintosh — even a Plus — with 2 megabytes of RAM. It runs as an application under the Mac operating system and so maintains the Mac's user interface and access to HFS, the Mac's native file system. Yet Tenon claims that it implements true preemptive multitasking. Single-user version, $595; unlimited-user license, $835; manuals, $175. Available first quarter of 1991.

What's New at NeXT?

Aggressive pricing, impressive speed, dazzling color, some great applications — and a floppy-disk drive! Is NeXT ready to jockey for position on the confirmed Mac user's desktop?

By Henry Bortman

Some people got excited about the first Mac. Other people said, "Neat idea, but too expensive, too slow, no color, no applications — and no room in the market for another platform. It will never sell." Experts agree: It *did* have problems. But once those problems had been corrected, there was plenty of room in the market for a desktop computer that did things, well, *better*.

Some people were excited about the first NeXT machine too. And although it had similar problems, in less than a year, NeXT has responded to critics with four new CPUs. They're fast, they cost less than their Mac counterparts (see Figure 1), and two of them are color-capable. Add to this the introduction of some darn good third-party applications (see the "Where's the Spreadsheet?" sidebar), and you have a very viable new platform. Here's what they have to offer.

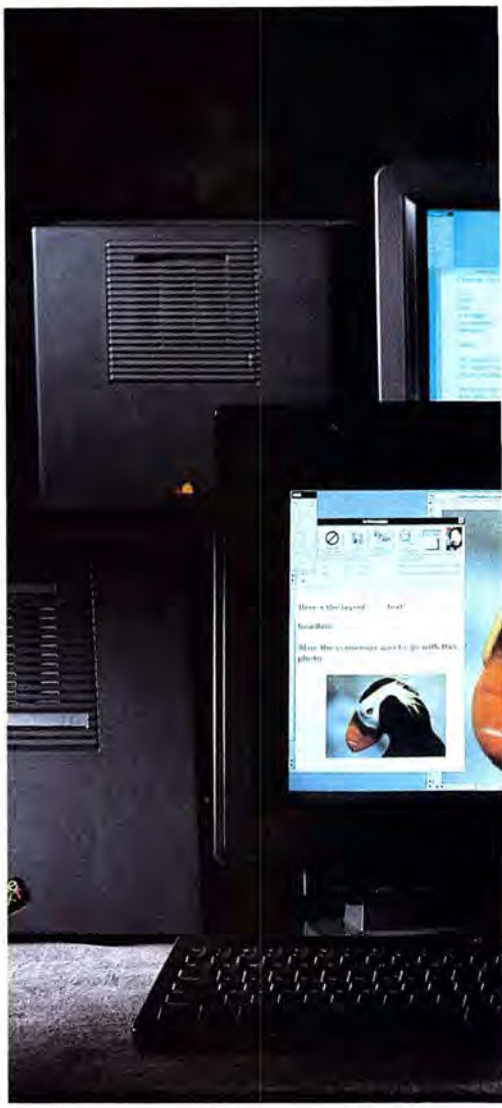
Hardware Specs

All four machines use Motorola's speedy new 68040 microprocessor, running at 25 megahertz. A hard-disk drive is standard equipment — you can get either 105 or 340 megabytes. The optical drive is now optional. (Hey, Steve, you can't win 'em all.) A 2.88-megabyte floppy-disk drive is also part of the baseline package. It can read UNIX- and DOS-formatted 720K, 1.44-megabyte, and 2.88-megabyte disks but doesn't support Mac floppies (grrr!). The minimum standard RAM configuration is 8 megabytes, expandable to 32 or 64, depending on the model. For networking, all machines come with built-in Ethernet; both thinnet and 10BASE-T connections are provided.

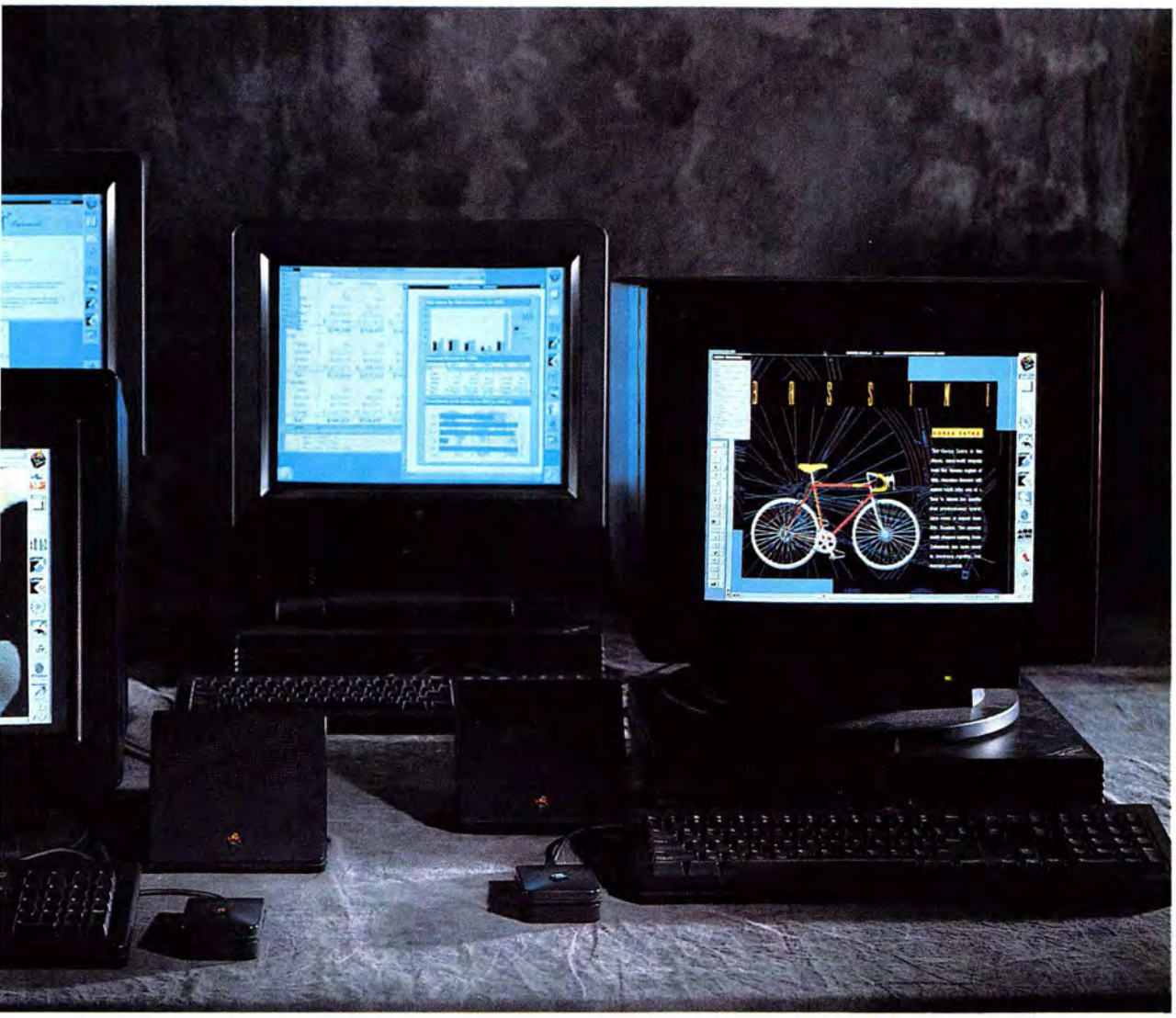
As mentioned, there are now four models. The vintage NeXT machine has been renamed the NeXTcube ($7,995 to $11,495). It comes with the same gray-scale MegaPixel Display as the original machine: 1,120 x 832 pixels on a 17-inch screen, 2 bits per pixel — and all the other hardware listed above. You can get an 68040 upgrade board for the original 68030 machine for $1,300 (an internal floppy is not included).

The really exciting news, however, is the top-of-the-line, 32-bit-color NeXTdimension ($14,115 to $17,615). This box will knock your socks off. It's actually a NeXTcube with an additional NeXTdimension graphics board and a 16-inch Sony Trinitron color monitor (1,120 x 832 pixels, 32 bits per pixel) in place of the gray-scale monitor.

The specs of the NeXTdimension board are just short of incredible: An Intel i860 33-megahertz RISC-based graphics coprocessor. Eight megabytes of RAM (expandable to 32 megabytes) dedicated to the i860, plus another 4 megabytes of VRAM for the display. A JPEG coprocessor for real-time image compression and decompression. And NTSC video input and output, with genlock. You can get a NeXTdimension graphics board for a NeXTcube (or for an original 68030 NeXT) for $7,115.



The NeXTdimension is fast. How fast? Try this on a Mac IIfx: Open two 24-bit-color images in an image-retouching program. Arrange the windows so they're overlapping.



PHOTOGRAPHY: WALT DENSON

NeXT's new lineup, clockwise from bottom left: the NeXTdimension 32-bit-color system, the NeXTcube, the low-cost NeXTstation, and the 16-bit NeXTstation Color

Move the top window. Watch the bottom one redraw. Now try it on a NeXTdimension. No visible redraw. The underlying picture's just there.

Although the price of these cubes is more than reasonable, NeXT has also added two pizza-box models for the budget-minded. The NeXTstation ($4,995 to $6,995) is a stripped-down version of the NeXTcube. It has the same basic hardware and monitor, but it's not expandable. The NeXTstation Color ($7,995 to $10,995) is a 16-bit-color system. It includes the 16-inch Sony Trinitron but has only (!) 12 megabytes of RAM and no i860 graphics coprocessor, JPEG hardware, or NTSC video in/out. There's no upgrade path from the NeXTstation to the NeXTstation Color and no announced trade-in policy.

The Next Step for NeXTstep

That's how the silicon lines up. What about the software? Software Release 2.0 includes the Mach version of UNIX, NeXTstep 2.0, and several bundled applications (an extended version provides a complete set of development tools as well). Release 2.0 offers several significant improvements over version 1.0A.

The Workspace Manager (NeXT's

equivalent of the Finder) and NeXTmail have had face-lifts. In addition, fax-modem send-and-receive capability is now an integral part of the system, and powerful new software has been added to support the color machines.

The Workspace Manager. Those of you who have had occasion to use the original NeXT machine probably appreciated the hierarchical view of the file directory that the Browser provided and cursed the process that made you open two copies of the Browser and drag an icon from one to the other in order to copy a file. This feature has been decommissioned in NeXTstep 2.0. The Browser is now one of three views of the file directory that can be displayed in the bottom of the new File Viewer (see Figure 2) — the other two are the Icon and Listing views.

The top part of the File Viewer contains two elements. One is an expandable "shelf," a temporary holding place for your working files and folders. You can park them temporarily on the shelf so they're readily accessible for copying, moving, or launching. This lets you handle all your files from a single window. Below the shelf is an "icon history," which displays a full directory path, including network connections, to the currently selected file or folder.

NeXTmail. The built-in E-mail system was one of the distinguishing features of the original NeXT machine. It let you attach a file to a mail message by dragging its icon into the message window. When the message arrived at its destination, the recipient could view the attached file by clicking on the message icon, which would launch the required application and open the file. Very civilized. And the original NeXTmail also had Lip Service, which allowed you to attach recorded sounds to mail messages.

Release 2.0 goes even further. Mail recipients can now drag file icons directly out of mail messages and save them locally as files. EPS and TIFF files get special treatment: If you drag a file of either of these image types into a mail message, the full image is displayed. Drag the image out on the receiving side, and it obediently reverts to being a file. The new NeXTmail also includes a provision for sending mail to non-NeXT systems.

Fax Modem. The ability to send and receive fax images is built in to Release 2.0. Sending faxes is now a print option (see Figure 3). You enable fax reception by attaching a fax modem to a NeXT machine and setting up a special folder to receive incoming faxes. If several users are on a network, this folder can be made accessible to everyone. However, users must peruse the folder for their own files, much as they would leaf through the incoming-fax basket that sits next to the office fax machine.

The Colors Panel. I made a passing reference to 32-bit color on the NeXTdimension. What I didn't tell you is that this is true 32-bit — not 24-bit — color. NeXT doesn't let those other 8 bits lie around with nothing to do. It uses them as

Figure 1: The Price of Power

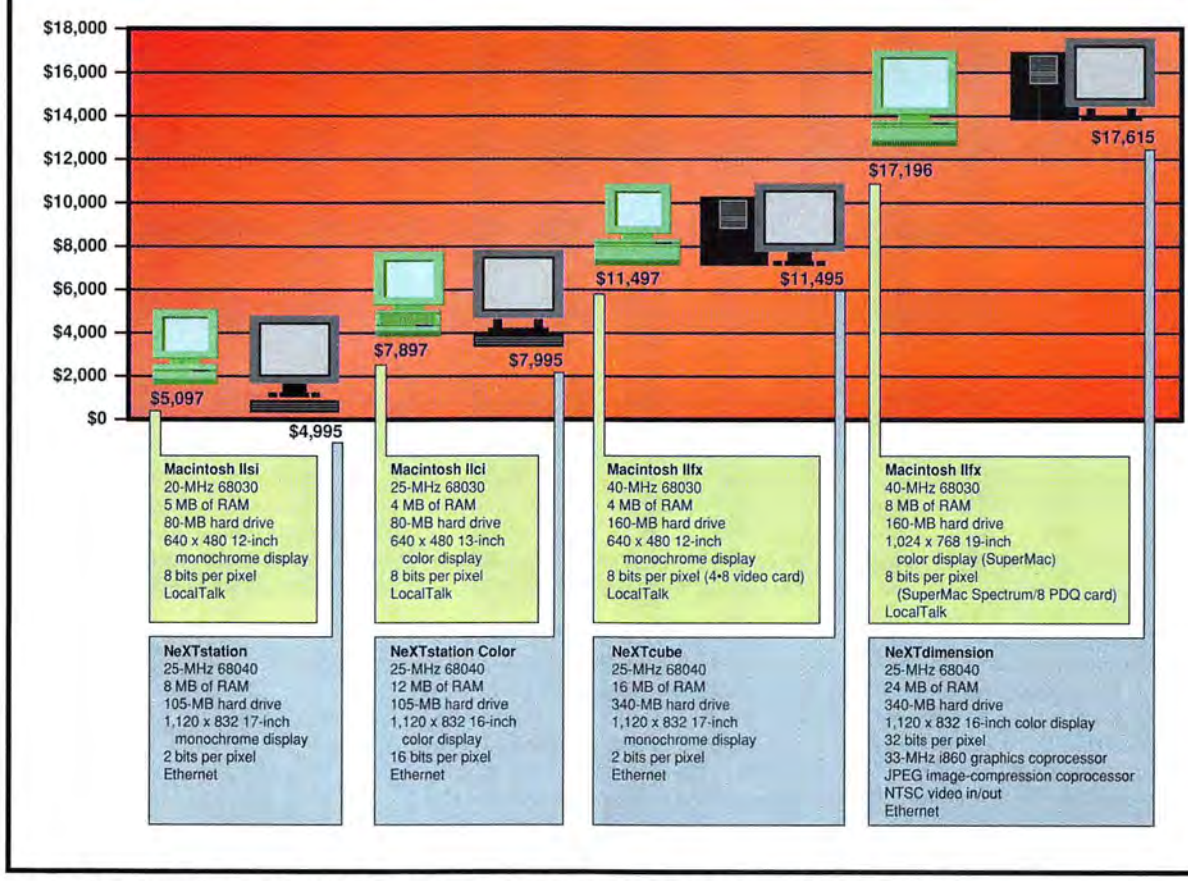
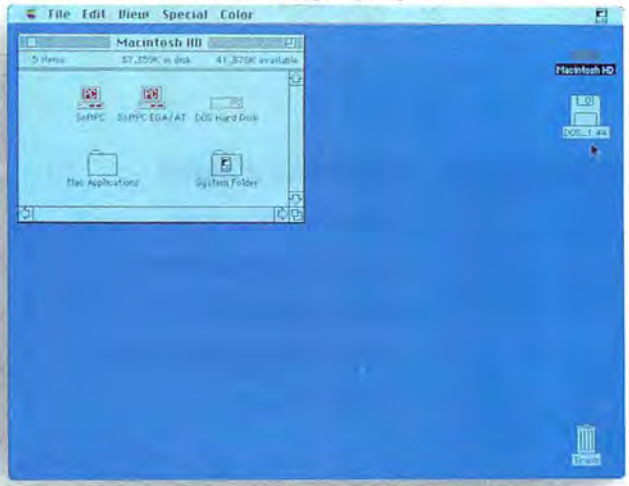
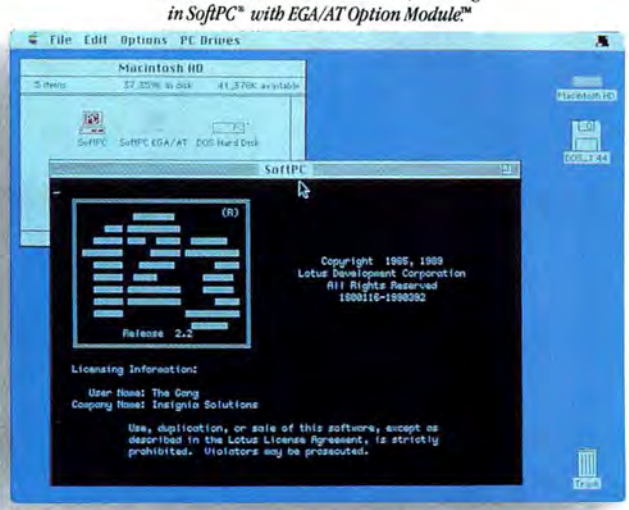


Figure 1: Compared with similarly priced Mac configurations, NeXT systems deliver far more bang for the buck.

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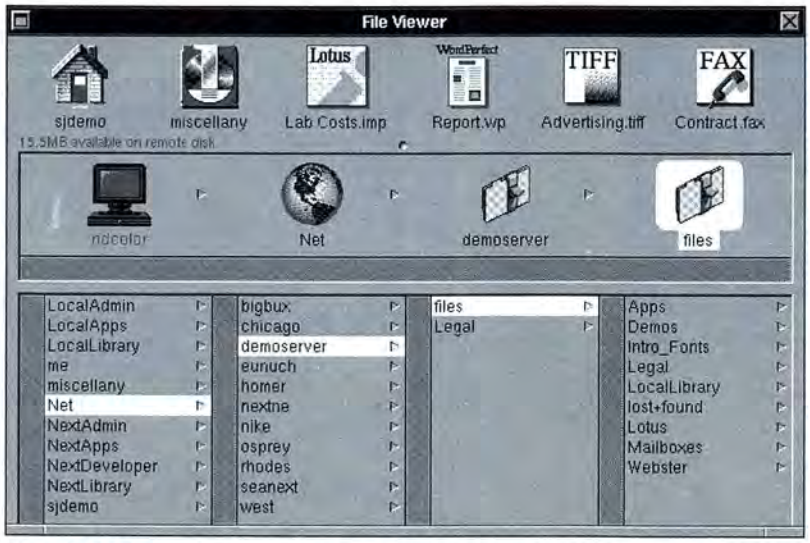


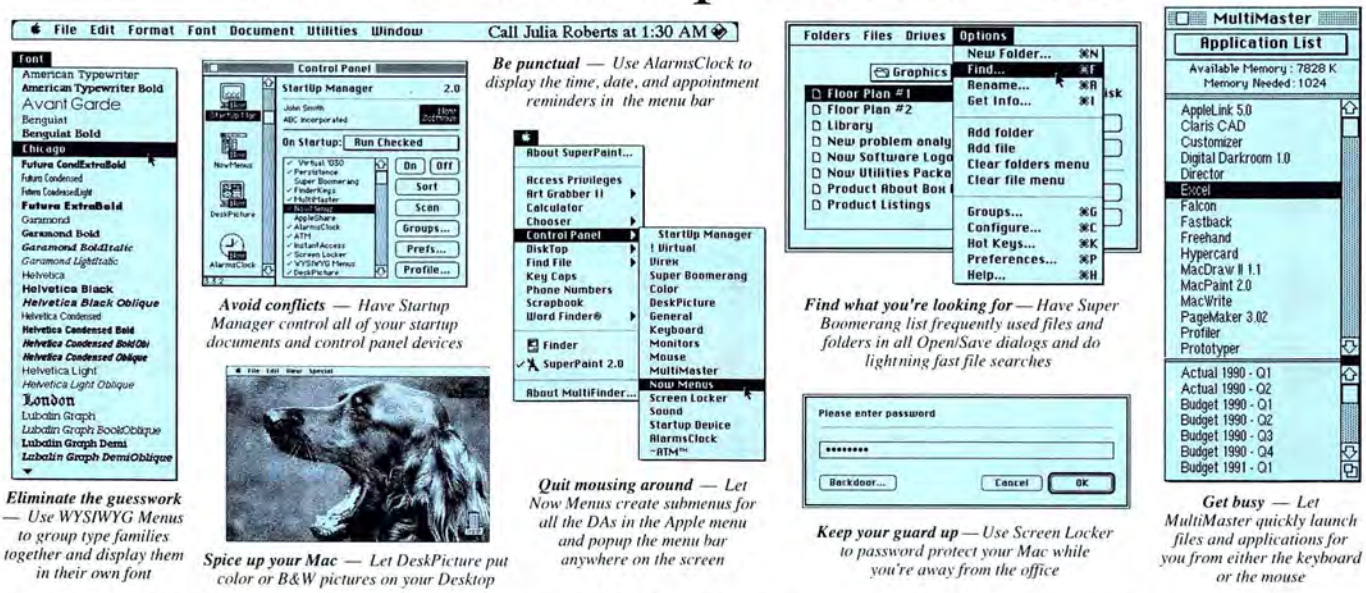
Figure 2: NeXT's new File Viewer contains a shelf (top) where you can store files and folders you are working with for easy one-window file management. Just below the shelf, the icon history displays a complete directory path to the currently selected file or folder. On the bottom is the familiar NeXT Browser.

The NeXT's alpha channel lets you assign transparency values to color images for easy image compositing.

an *alpha channel*, which lets you assign transparency values as well as color values to images. This is, in effect, an extension of Display PostScript; one of the PostScript model's greatest shortcomings is its inability to handle transparent images. NeXTstep's Colors panel — similar to the Mac's Color Picker but more advanced — is where color and transparency values are assigned.

Support for creating composite images is also built in to the system (see Figure 4). You can overlay multiple images to create a single composite image, but each component image remains a separate, floating

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object that can be moved ad infinitum without permanently changing the final image. Transparency lets you see through one image — a window in a car, for example — to another image — such as a tree by the side of the road — behind it. Macs can't do this — at least not without a bunch of extra fancy programming.

Icon, a demonstration application that comes with Release 2.0, includes Composite Lab, a feature-laden image-processing program. This is only a start, however. Expect to see some phenomenal image-processing, video, and multimedia applications appear on NeXT machines in the coming year — applications that may well run circles around competing offerings for the Mac.

What's Missing?

There are a few things missing, of course. The primary one, in my opinion, is connectivity to other systems. Some 3270-connection products have been announced. Insignia is developing SoftPC for NeXT, which will give NeXT users the ability to run DOS applications directly. But this field needs a lot of filling out.

I expect NeXT machines to find themselves in many of the same places Macs are found now and that they'll be able to share files. Yet NeXT computers can't currently access data on AppleShare servers easily, nor can they print to any of the LaserWriters on the AppleTalk networks to which they are connected. NeXT needs to license the AppleTalk protocol stack from Apple and implement it as part of system software. (And I think it'd let even *you* do that, Steve.)

Similarly, Novell has announced that it will provide NetWare client software for NeXT machines, but it hasn't said when. Sooner would be better than later.

Full integration with other mail systems, including the ability to exchange attached files and sound recordings with the systems that support those features, will also help speed NeXT systems' acceptance.

Database access is another area in which NeXT systems need work. Sybase and



Figure 3: The ability to send (and receive) PostScript-quality faxes is built into Release 2.0 as part of the standard Print dialog box.

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Figure 4: For defining colors, the NeXTstep software uses 24 bits of the 32 available for RGB values and the other 8 for an *alpha* channel, allowing users to specify transparency as part of a color definition. To create the composite image on the right, portions of the bottom left image were made partially transparent and the image was floated in front of the image of the Golden Gate bridge. The two images remain separately manipulable in the composite.

Oracle have announced plans to implement their relational-database systems on NeXT computers. More important, though, is that the Data Base Kit for developers — Steve Jobs alluded to it in the rollout of the new machines, but it hasn't been officially announced — be completed as soon as possible. This would make it as easy for a NeXT application to access data from any relational database on a network as it now is to print.

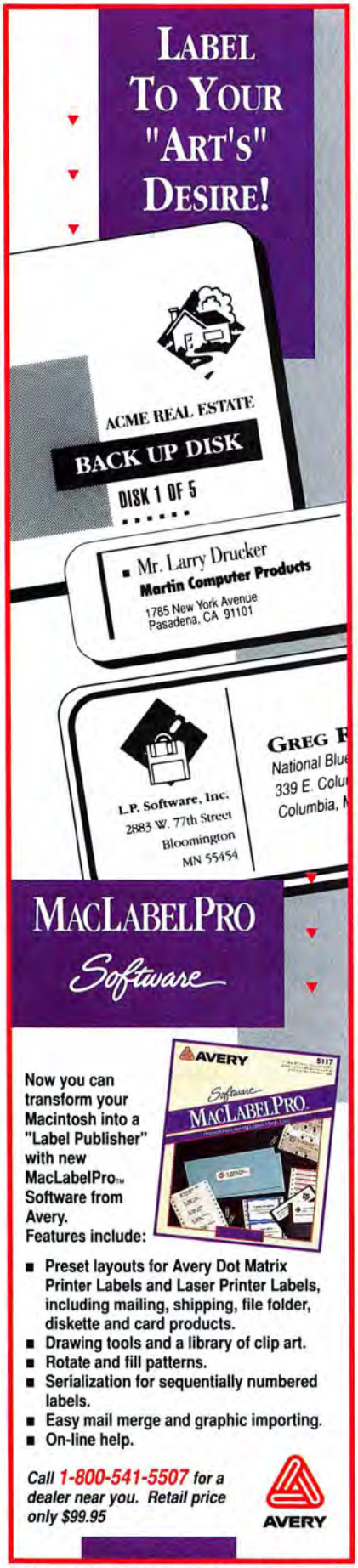
Another missing thing is HyperCard. Not HyperCard, the Claris application, but HyperCard, the functionality. NeXTstep, being object-oriented, is promoted as the easiest application-development environment yet conceived by humanity. When Steve shows off a NeXT machine, he runs through a little exercise in which he drags some buttons and fields onto a window, connects them to objects that do things such as get some data and make a graph, and — voilà! — he's created a usable application. But try to do that as J. Q. User — I have, and it ain't all that easy. The power of the NeXT user interface hasn't been brought to the user.

I can write a computer program if I have to. But I hate programming. And I've never managed to fathom the depths of *Inside Macintosh*. Often, however, I can create something with HyperCard that works the way I want it to. NeXT doesn't have anything similar, which is a shame. It has a real opportunity here. It could — and should — create a way to build a program that's *so* easy that users can create custom applications without even realizing they're programming. A graphical, interactive development environment for the complete idiot.

So, Will They Sell?

Gee, I left my crystal ball at home. But I hope so. The innovations in the NeXT machines' user interface, their seamless integration of applications, and their object-oriented development environment are technological advances that earned even the first NeXT machine a place in computing history. Granted, the sluggishness of what should really be termed the "beta box" made it more a proof of concept than a functional computer. Its lack of applications consigned it to the realm of curiosity. NeXT is now giving Apple some serious competition in the mid to high end of desktop functionality. The performance of the new machines, together with the growing list of available software, makes these second-generation NeXT systems serious contenders for a place on the corporate desktop.

I want one.



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Where's the Spreadsheet?

Common wisdom has it that no computer can succeed in the desktop market without a spreadsheet program. NeXT offers a choice of several, including Ashton-Tate's PowerStep and WingZ from Informix. But Lotus Improv is the real killer (see "Twin Peeks," December '90, page 27). If you thought 1-2-3 was all Lotus was capable of, the company has a surprise for you. Improv redefines the spreadsheet. Say goodbye to *D4 = B4 – C4* and hello to *Profit = Revenues – Expenses*. Moreover, if your spreadsheet has categories within categories, you can rearrange the view of your data dynamically by dragging category names from one part of the spreadsheet to another (see Figure A).

There are also bread-and-butter applications in several other categories. WordPerfect will soon join WriteNow with a NeXT version (but no word on Word). For desktop publishing, QuarkXPress will migrate to NeXT systems (FrameMaker is already available). Adobe will bring out a NeXT version of Illustrator 3.0. And Altsys, creator of Aldus FreeHand, is developing a very FreeHand-like but as-yet-unnamed drawing program.

NeXT has also spawned some innovative software that's not available on other computers. For example, TouchType from RightBrain Software is a typesetting program that lets you adjust the spacing of individual characters or groups of characters simply by dragging them closer together, farther apart, up, or down. As a side benefit, kerning-pair changes can be saved automatically into the NeXT machine's global font tables.

Then there's optical-character-recognition software from HSD. That's not innovative, you protest. Ah, but it is. Because this OCR is designed to be a "service" on the NeXT system, meaning that it can be accessed from *any* NeXT application. So when you receive that fax over a network and need to turn it into editable text, OCR is just a menu-click away.

There will be other applications, particularly in the graphics-processing and multimedia fields. NeXT provides developers with a tremendous amount to work with. You can expect them to take advantage of it.

Worksheet1 • View1 — Profit Analysis.imp

Item | Year | Division

	1988		1989		1990	
	Eastern	Western	Eastern	Western	Eastern	Western
Revenue	$30,000	$84,000	$43,000	$97,000	$64,000	$125,000
Expenses	$27,000	$58,000	$32,000	$61,000	$45,000	$80,000
Profit	$3,000	$26,000	$11,000	$36,000	$19,000	$45,000

Item | Calc

Worksheet1 • View1 — Profit Analysis.imp

Item | Year

		1988	1989	1990
Eastern	Revenue	$30,000	$43,000	$64,000
	Expenses	$27,000	$32,000	$45,000
	Profit	$3,000	$11,000	$19,000
Western	Revenue	$84,000	$97,000	$125,000
	Expenses	$58,000	$61,000	$80,000
	Profit	$26,000	$36,000	$45,000

Division | Item | Calc

Figure A: With Lotus Improv's "flexible views," modifying your view of your spreadsheet data is as easy as dragging an icon. Here, the Division category icon has been moved from the top right of the screen to the bottom left, rearranging the spreadsheet to reflect new relationships.



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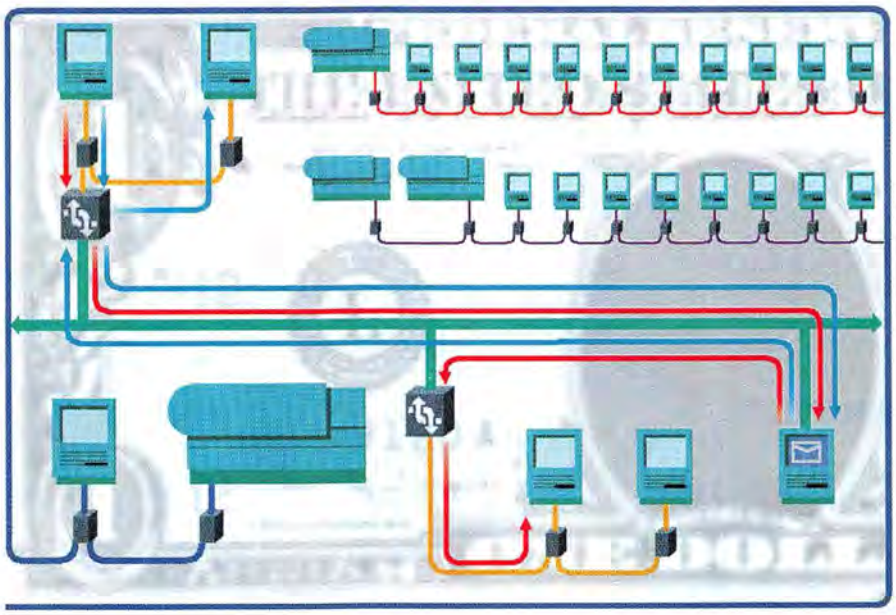
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Analyzing Network Costs

Network equipment may seem expensive, but its annual cost per user is the real bottom line.

By Kurt VanderSluis



No question about it: Networks are expensive. But when you're calculating your network cost, the most important consideration is how much its services cost per user. It's misleading to consider the cost of a device itself — an extra laser printer, for example — without taking into consideration the number of people who can share the services that the device provides.

Let's imagine a network that provides shared LaserWriters, AppleShare file servers, and electronic mail. The cost of providing those services includes buying the twisted-pair wiring, connectors, and LocalTalk hubs; the LaserWriters, file servers, and E-mail software; plus the cost of the network manager's salary, user training, and training materials for the users.

You can perform an "alternatives analysis," using a spreadsheet program to determine how much different network configurations cost. I frequently do consulting work for companies that are planning to install or upgrade their networks.

One of my favorite reasons for using a cost-analysis tool is that often network managers of non-Mac, non-AppleTalk network systems are asked to generate cost figures for their networks to compare against my projected costs for networking Macs. And my experience has been that LocalTalk-networked Macintosh computers compare very well with networked PCs. They often provide identical service sets at as little as half the cost per workstation.

I'll keep the financial analysis very simple. Let's consider a company with 200 Macs networked into eight LocalTalk work groups connected to an Ethernet backbone. On each LocalTalk network are two LaserWriters and two SE/30s, which do double duty as AppleShare file servers and E-mail servers. Let's also suppose all the equipment on the network has a useful life span of four years. In addition, there are two network managers who earn $45K a year each.

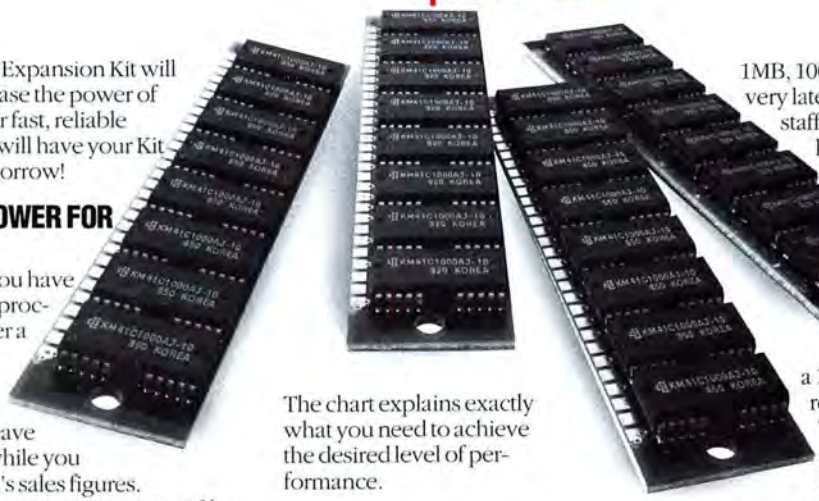
There are many other factors to consider, such as the cost of consumables (paper, toner cartridges for the printer, and the like), the cost of training, and the tax benefits of depreciating capital equipment, but I want to keep the model simple so that the dynamics of the method are clear. Also, I won't factor in the cost of the Macs, because I'm trying to calculate a network cost. The calculations put the cost of networking at $647 per user per year, which equals about $2.60 per workday.

Suppose you're considering adding a LaserWriter to each LocalTalk network or that you're thinking of dividing a network into smaller LocalTalk work groups. You can use the spreadsheet to calculate the cost of various alternatives. Figure 1 shows a graph of the results. You can see that adding a third LaserWriter to each LocalTalk network costs only $45 per person annually.

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2-1/2 MB	Remove only two 256K SIMMs, install two 1 MB SIMMs.
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HyperGlot Language Software (Spanish)
HyperGlot Language Software teaches you how to speak Spanish like a native. Features include vocabulary building drills to learn basic words, verb usage and digitized pronounciation guides. Also available in Chinese, French, German, Japanese and Russian. **$35.**



VocabuLearn/ce 2.0
VocabuLearn/ce is a dynamic, computer-enhanced foreign language learning system for the Mac. This versatile, interactive HyperCard stack is available in five languages and two levels. Each package includes two 90-minute audio cassettes, plus a convenient word list with over 1500 useful words and expressions. An ideal learning tool for students, travelers, business people, and educators. **$35.**



Record Holder Plus 3.1
Record Holder Plus is a database manager that is easy to set up and use. It offers a wide variety of field types, extensive input editing and validation, variable length text fields (up to 32K), and full reporting capability with multi-level sorting and subtotaling. Stores graphics, and print in color on the ImageWriter II. **$95.**



ProModem 9600
The only V.32 Data Modem with fax capability both at 9600 BPS. Supports MNP-5 and V.42 error correction/MNP-5 data compression. Comes with MAcKNOWLEDGE (TM) communications software; Maxfax, a fax software program; plus a Mac cable. **$699.**

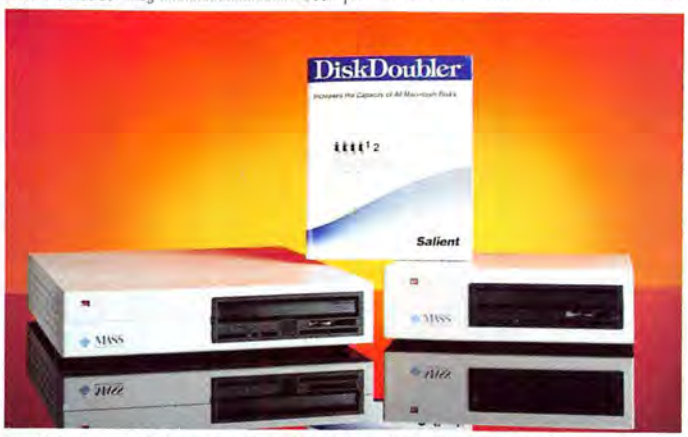
Software Discoveries
Record Holder Plus 3.1 95

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Aldus
DesignTeam 889.
PageMaker 4.0 499.
PrePrint 329.
LetraSet
Design Studio 495.
Letra Studio 275.
OLDUVAI
Read-It! 2.1 (OCR) 278.
Read-It! Personal 2.0 169.
Quark
QuarkStyle 189.
XPress 3.0 529.
TimeWorks
Publish-It! Easy 113.

DISK DRIVES/BOARDS

Applied Engineering
AE HD MacDrive 245.
Aura Systems
Scuzzy Graph 729.
Cutting Edge
800K External Floppy Drive 149.
SyQuest Removable 44 Meg 699.
Under the Mac 20 Meg or 339.
Under the Mac 30+ Meg 399.
Under the Mac 45+ Meg 449.
Under the Mac 60+ Meg 489.
Under the Mac 80+ Meg 539.
Nova 40+ MB 565.
Nova 80+ MB 745.
Nova Removable 40+ MB 979.
Peripheral Land, Inc.
Infinity Dual 40 Meg Turbo 1875.
Infinity Turbo 40 Meg 799.
Turbo Floppy 1.4 359.
Power User™
20 Meg Drive 329.
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DataPak Removable Cartridge Hard Disk Drives (Mass Microsystems)
The DataPak Removable Cartridge Hard Disk Drives contains the industry-standard 45 MB cartridge mechanism. Its 20 ms access time outperforms many fixed disk drives. Whenever you need more hard disk storage capacity, just add another economical 45 MB cartridge. Great for storing TIFF files from scanners. You can carry 45 MB worth of data in your coat pocket and ship it via overnight courier. For sensitive data, lock up the cartridge (not the entire system) in a safe place. Includes Disk Doubler, plus PadLok volume partitioning and password protecting software, and 4 MB of outstanding shareware. Includes Manufacturer's two-year warranty. (drives). **$799.**

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Dayna File Dual 360K & 1.44M 749.
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Kennect Technology
Drive 2.4 329.
Drive 360 or Drive 1200 ea. 259.
Rapport 199.
Mass Microsystems
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Micron Technology
Multiple Resolution Video Card 695.
Xceed 8-bit Video Card NB6-48 349.
Xceed IICi-128 Cache Card 379.
Xceed SE/3010-78 & NB10-78 ea.549.
Xceed SE/306-48 349.
Orange Micro
Grapplers Call
Mac 286 Co-Processor 1079.
Microtech
Athena A 50 MB 599.
Athena A 100 MB 899.
Europa 20+ MB 379.
Europa 40+ MB 419.
Europa 80+ MB 599.

AE HD Mac Drive & QuadraLink (Applied Engineering)

QuadraLink
QuadraLink solves the problem of clogged serial ports. Add four additional serial devices (printers, plotters, scanners, modems, etc.) to your Mac II. QuadraLink is compatible with Mac's Communication Toolbox, System 7.0 and includes a "shadow driver" to recognize older software. (Mac II family only) (input). **$215.**



AE HD MacDrive
Add a second SuperDrive to any SuperDrive-equipped Macintosh with AE's High Density Mac Drive. Access and copy files without continually swapping disks. AE's 1.44 MEG drive incorporates a Sony mechanism and features a two-way read/write indicator light. (drives) **$245.**





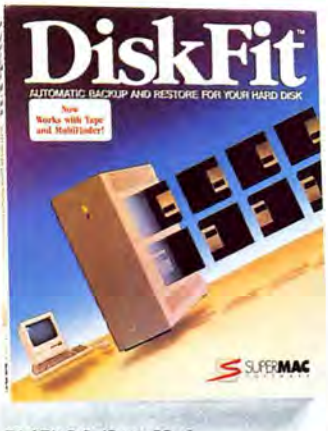
ResumExpert (Word 3.0/4.0 version) (A Lasting Impression)
Whether you're seeking an entry-level position or an executive's corner office, the ResumExpert Software Series is the next best thing to knowing the boss. Professionally written and fully-formatted Microsoft Word templates let you easily create eye-catching resumes. MacUser 10/89 awarded ResumExpert 4 mice and raved about the "excellent manual" that includes expert writing tips. MacUser 12/89 rated it as one of the Top 200 software Programs of 1989. See line listing for all 10 editions. (business). **$49.00 ea.**

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Broderbund
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Educorp
Lingua-ROM 279.
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VocabuLearn 2.0 French, Spanish, German, Italian, Russian, Hebrew or VocabuLearn Japanese .. ea.35.
Personal Training Systems (full line available)
Personal Training for the Mac, Excel 2.2, FileMaker II, Freehand 2.0, HyperCard, Illustrator 88, PageMaker 4.0, Persuasion 2.0,Quark 3.0, Works 2.0, or Word 4.0 ea. 52.

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Planisoft 199.
Planisoft Office 5 pack 579.
Planisoft Office 10 pack 839.
Ashton Tate
Full Impact Special 149.
Avery Label
MacLabel Pro 49.
CE Software
CalendarMaker 3.0 31.
Claris
MacProject II 365.
SmartForm Designer w/Assistant 289.
Deltapoint
Delta Graph 1.5 109.
Dubl-Click
Calculator Construction Set v. 2.0 45.
Informix
WingZ 1.1 245.



DiskFit 2.0 (SuperMac)
This simple, reliable utility backs up to all types of media in Finder readable format for fast foolproof file location and recovery. It's advanced incremental backup feature makes it easy to stay backed up; and it's ability to reclaim space keeps your backup set small and compact. New 2.0 version now has enhanced folder selection, unattended backup and more. Try Network DiskFit for AppleShare and TOPS networks. (utility). **$58.**

JAM Software
Smart Alarms & Appt. Diary 64.
Smart Alarms (1 - 4 users) 125.
Smart Alarms (5 - 8 users) 189.
Kaetron
Top Down 2.0 229.
Mainstay
MacSCHEDULE 2.5 139.
MacSCHEDULE Plus Call.
Microsoft
Excel 2.2 or PowerPoint 2.1 ea.245.
The Microsoft Office 529.
Works 2.0 179.
Portfolio Systems
Dynodex 1.2 w/DA or Dynopage ea. 57.
Power Up
Address Book Plus or Letter Writer Plus ea. 52.
Calendar Creator 35.
FastForms 2.0! 105.
Shana Enterprises
Informed Designer 159.
Softview (full line available)
if:XDOD Expense Reports ea. 49.
if:X Forms Designer 175.
Symantec
More 3.0 265.
Symmetry
KeyPlan 245.
SYNEX
MacEnvelope Plus 2.0 159.
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T/Maker
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Integrated small business accounting system with General Ledger, Accounts Receivable and Payable Ledgers, Payroll, Inventory and Project Management. Works with service businesses, professionals, manufacturers and retailers and is designed to provide complete business and financial management. Features invoices, purchase orders, receipts and payments that post to journals automatically. Includes 100 up-to-date reports, statements, password protection, export, help screens and tutorial stacks. (accounting). **$345.**



Vertical Solutions
FastLabel 2.0, FastEnvelope or FastCat ea. 45.
Zedcor
DESK 229.

CAD/CAE

Claris
ClarisCAD 2.0 649.
Graphsoft
Blueprint 219.
MiniCad+3.0 595.
Innovative Data Design
MacDraft 2.0 193.

COMMUNICATIONS & NETWORKING

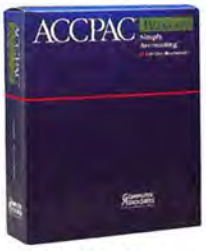
CE Software
In/Out (1 to 5 Users) 128.
QuickMail 2.2 (1-10 Users) 315.
CompuServe
CompuServe Navigator 3.0 49.
CompuServe Subscription Kit 23.
DataVIZ
MacLink Plus w/PC 4.5 117.
MacLink Plus/Translators 99.
Farallon™
PhoneNET® Plus, SE & II 35.
PhoneNET® Plus, SE & II 10 pack 219.
PhoneNET Star Controller ™ with Star Command™ 825.
Portable Pack 329.
Star Controller™EN 1669.
Timbuktu Remote ™2.0 Access Pack 845.
Timbuktu 3.1™ 95.
Timbuktu Remote™2.0 123.
FreeSoft
White Knight v.11 85.
InSignia Solutions
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Microcom Software
Carbon Copy Mac 117.
Prodigy
Mac Starter Kit 27.
SITKA
FlashCard 155.
INBOX Plus 3.0 1299.
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TOPS 3.0 DOS Network Bundle 165.
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Solutions
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FaxGate Plus 1.1 239.
MailMaker 25.
MailMaker (5-Pack) 129.
MailMaker (10-Pack) 225.
Traveling Software
Lap-Link III Connectivity Pac 99.
Lap-Link III Network Pac 99.

DATABASE SOFTWARE

Acius
4th Dimension 2.0 489.
File Force 249.
AEC Management Systems
AEC Information Manager 409.
Ashton-Tate
dBase Mac Special 59.
Claris
FileMaker Pro New 218.
Fox Software
FoxBASE+/Mac 2.0 292.
Preferred Publishers
DAtabase 1.5 68.



TelePort
TelePort, a 2400 baud MNP5 compatible ADB modem, is the perfect choice for powerful yet compact Mac communication. It packs Hayes compatibility as well as error free communication. Operating at speeds up to 4800 bps it plugs into an affordable desktop/port freeing unit not much bigger than your mouse. TelePort is fully auto bauding and requires no external power supply. **$129.**



ACCPAC Bedford Simply Accounting 1.1
Take control and manage your business more effectively. Includes general ledger, accounts payable and receivable inventory and invoicing, job costing and payroll. Print income statements and balance sheets, or create journal summaries that list transaction detail for the current fiscal year. **$225.**



FastLabel 2.0
Stick It to the chore of simple label printing in three easy steps! Import addresses, lists and graphics then use FastLabel's preformatted templates (or create your own) to produce everything from disk, VCR, and cassette labels to name badges, signs and more. **$45.**



FastEnvelope
This handy DA lets you import lists and graphics to print eye-catching envelopes, then adds postal bar codes saving you time and money on bulk mailings. Prints on any Mac compatible printer and can be configured in U.S. or metric units. **$45.**

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- Corporate purchase order accepted subject to credit approval.
- All products are covered by a 120 day limited warranty.*
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- Alaska, Hawaii, outside continental U.S., APO/FPO call 908-367-0440 for information.

*Defective software replaced immediately. Hardware replaced or repaired at our discretion. **We regret that we cannot be responsible for typographical errors."

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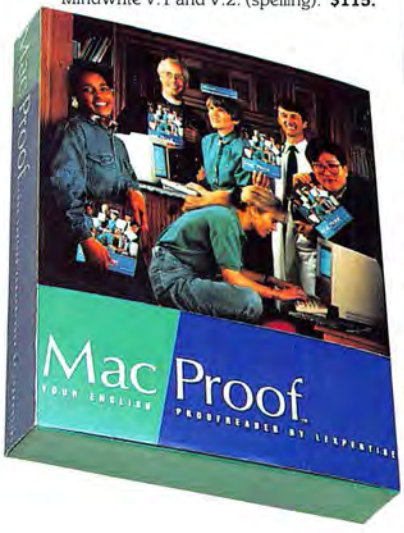
Rival Monitors (MegaGraphics Display System)
MegaGraphics Large Screen Monitor Systems include both the interface card and the monitor. Choose monochrome, gray scale, 8 or 24-bit color. All monitors include an ergonomically designed tilt/swivel stand. The systems operate at a high refresh rate (69 to 75 Hz) to deliver a stable, flicker-free image, with a 75 dpi resolution (1024 X 826 pixels). All come with the manufacturer's one-year warranty (extended warranties available through the manufacturer at extra cost). (hardware). Starting at **$1269.**

SAS Institute
JMP 629.
StudyWare
Computer Test Preparation Series ea. 29.
Voice & Video Instruction Videos
HyperCard or Pagemaker 3.0 ea. 39.
Word 4.0 Video Tape 39.

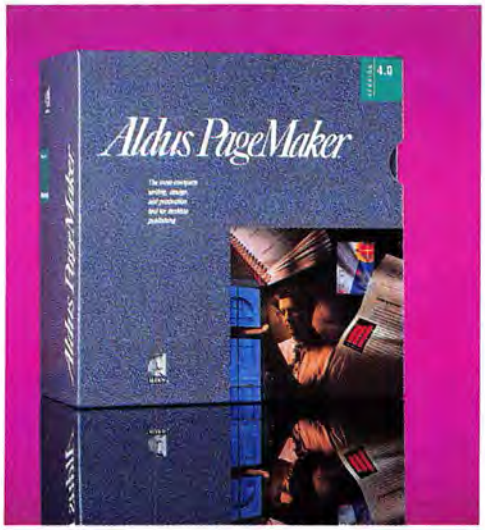
ENTERTAINMENT

Artworx
Bridge 6.0 29.

MacProof 3.2.1 (Lexpertise)
MacProof 3.2.1 is your English proofreader. Without leaving your document, it proofreads all text written on your word processor: business, educational, personal and professional. MacProof is a desk accessory for the Macintosh Plus, SE, II and IIcx. It checks mechanics, word usage, writing style and structure. You can customize the usage and spelling dictionaries to your specific requirements. Compatible with MacWrite II V. 1.0, MacWrite V. 4.6 & 5.0, Microsoft Word 4.0, PageMaker 3.0/3.01/3.02, w/2mg memory, MindWrite V.1 and V.2. (spelling). **$115.**



Broderbund
Shufflepuck Cafe 23.
Where is Carmen Sandiego? ea.29.
Bull City/Mysterium Tremendum
Moriarity's Revenge 32.
Bullseye
P-51 Mustang 36.
Ferrari Grand Prix 31.
Fokker Triplane 23.
Centron Software, Inc.
BlackJack Ace or CrapsMaster ea.27.
BlackJack Strategy Tester 65.
CasinoMaster (5 pack) 49.
CasinoMaster Deluxe Mac II version 55.
Electronic Arts
Block Out 26.
Curse of the Azure Bonds or StarFlight ea.39.
Sir Tech
Wizardry 35.
Spectrum Holobyte
Faces 25.
Tetris 22.
Welltris 20.
The Software Toolworks
ChessMaster or Life & Death ea. 32.



Aldus PageMaker 4.0 (Aldus)
Aldus PageMaker 4.0 is a complete writing, design and production tool to create professional-looking, high-quality publications. Version 4.0 offers 75 new enhancements and features including a new Story Editor with search and replace by characters, fonts, point sizes, or paragraph styles. New typographic controls improve page appearance and you can rotate text in 90 degree increments. Handles book length documents, generates tables of contents and links graphic elements with related text and MUCH MORE!. (desktop publishing) **$499.**

Three Sixty
Sands of Fire 32.
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Go Master 4.4 45.
Nemisis Deluxe 99.
Visionary Software
Synchronicity 2.5 49.
XOR
MacGolf Classic 52.
MacSki 40.
NFL Challenge 55.
Road Race 39.

FONTS

Adobe (full line available)
Adobe Type Manager 2.0 55.
Adobe Type Reunion 38.
TypeAlign 59.

Rapport & Drive 2.4 (Kennect Technology)

Rapport
Rapport extends the power of your present internal floppy disk drive and offers new functions when combined with Drive 2.4 or the Apple 800k external drive. Plug it into the external floppy drive port on your Mac and give your internal floppy drive the ability to read 720k MS-DOS disks. **$199.**

Drive 2.4
Allows you to read, write and format 3.5 inch disks in any Mac or DOS standard. Increases the capability of standard (800K) floppies to 1.2 Megabytes and stores as much as 2.4 Megabytes on the new high density disks Together, Drive 2.4 and Rapport give you expanded floppy disk storage—plus MS-DOS connectivity. Comes with Fifth Generation's FastBack II. (drives) **$329.**

TypeSet1 or 2 ea. 58.
TypeSet3 129.
Altsys
Fontagrapher 3.1 249.
Metamorphosis or The Art Importer 2.0 ea. 85.
Dubl-Click
Menu Fonts 3.0 28.
Letraset
LetraStudio 275.
Pacific Data Products
MacPage 425.
MacPage PE 459.
Tactic Software
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Smart Art I, II, II, or IV ea. 59.
Streamline 225.
Aldus
Freehand 2.0 329.
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interFACE 249.
Broderbund
TypeStyler 1.5 119.
Claris
MacDraw II 289.
MacPaint 2.0 92.
Computer Friends
ColorSnap 32+ 649.
Creative Software
Easy Color Paint 2.0 47.
Deneba
Canvas 2.1 189.
Ultra Paint 125.
DigitalVision
Computer Eyes B&W 199.
Computer Eyes Pro Color 349.
Dream Maker
Cliptures, Vol. 1, 2 or 3 ea.69.



LabelWriter
The palm-sized LabelWriter puts anything you can create with your Mac onto a 1"x 3-1/3" thermal label (130 per roll). The exclusive print driver software lets you print directly from your database, word processor and any other application. In vertical or horizontal format. **$185.**



TopDown 2.0
TopDown lets you create great looking flowcharts, organization charts, process flows, documentation sheets and training materials quickly and easily. Instantly write, draw and update your diagrams. Hide or show details in a hierarchy of drawing levels. TopDown's many special features make it powerful yet easy-to-use. **$229.**



StudyWare Computer Test Preparation Series
Be prepared for SAT's and ACT's with hundreds of review questions and an on-screen glossary. Studyware explains the reasoning behind both the correct and incorrect answers to better understand how test makers think. **$29 ea.**





MacModem 9600 V.32 (Microcom)
MacModem V.32 uses MNP Class 9 technology for superior throughput up to 38,400 bps even over noisy telephone circuits. The result is high speed, error-free data transfer for reliable cost-saving data communications. Compatible with CCITT V.32, V.22, Bell 212A and 103 modulation standards as well as the Hayes™ AT command set. Includes Carbon Copy Mac Twin-Pac and Quick Link II. (modems). **$689.**



MacPrint 1.2
Lets you print Mac documents on your HP LaserJet or LaserJet IID printer. It handles all the HP internal and cartridge fonts, and prints the others as bitmaps. Cable included. Does not support PostScript. **$95.**

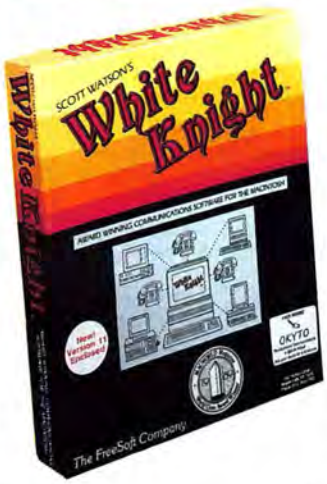


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Add power to your documents with fabulous art images. They make newsletters, presentations, reports and brochures communicate more effectively. Each of the 18 ImageBase packages contains at least 100 topic-related images drawn by professional artists. **$85 ea.**



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Contains all of the great tools of 3.0, but a newly designed interface makes it easier to use. For budgeting, checkwriting, portfolio management, net worth calculation and long term planning. Includes, **Checkfree** electronic bill paying service. **$135.**

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Studio/8 189.
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MediaTracks Multimedia pack™ 319.
MediaTracks™ CD ROM 319.
Innovative Data Design
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ColorStudio 649.
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Digital Darkroom 2.0 259.
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SuperCard 1.5 205.
SuperPaint 2.0 135.
Solutions, Inc.
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SmartScrap & The Clipper 2.01 56.
Strata
StrataVISION 3d 375.
Strategic Mapping, Inc.
Atlas Map Maker 4.5 369.
Studiotronics
Colorset 1.5 229.
SuperMac
PixelPaint 2.0 225.
PixelPaint Professional 2.0 465.
Tactic Software
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Icon-It! 2.1 45.
T/Maker
Click Art Business Images 32.
EPS Illustrations 82.
Business Cartoons 33.
Zedcor
DeskPaint 3.0 inc. DeskDraw 115.

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Aapps
DigiVideo B&W 399.
DigiVideo Color 659.
Co Star
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MegaGraphics Display Systems
Rival 2001 System for Mac II 1269.
Rival 3001 System for Mac SE/30 1269.
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16" Color 2008 Hi-Res/Mac II 2679.
Grayscale 2008/Mac II 1879.
Grayscale 3008/Mac SE/30 1899.
Microtek
Microtek MSF-300GS Scanner 1375.
Microtek MSF-300ZS Scanner 1998.
NEC (Full line available)
Intersect CDR-35 399.

White Knight V.11 (FreeSoft)
This award winning communications software includes a reworked user interface with completely reorganized menus and enhanced terminal support including support for the VT-102. It supports the new ZModem protocol, as well as more versions of XModem and Kermit. It works properly with MultiFinder and supports both color QuickDraw and large monitors. Get a *free* subscription to GEnie and a *free* copy of Okyto (a revolutionary Mac-to-Mac file transfer program) with each copy of White Knight. (communications/networking). **$85.**

Qume
Crystal Print Publisher 3.02 2499.
Seikosha America
Seikosha Printer (dot-matrix) 235.
Sharp (full line available)
The Wizard - 7000 219.
The Wizard 7200 (64K RAM) 255.
ThunderWare
LightningScan 400 385.
ThunderScan Plus 199.

INPUT/OUTPUT

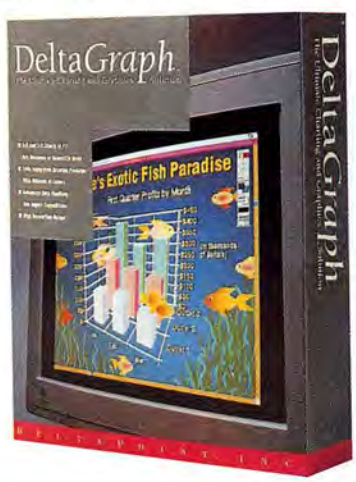
Applied Engineering
QuadraLink 215.
Basic Needs
Cordless Mouse 95.
Caere
Typist 479.
Calcomp
DrawingBoard Digitizers 12" x 12" 319.
DrawingBoard Digitizers 12" x 18" 609.
DrawingBoard Digitizers 18" x 24" 1359.
WIZ Tablet 159.
WIZ Pen 57.
WIZ Templates 19.
CH Products
Mach IV Plus Mouse/Joystick 51.
CoStar
LabelWriter 185.
DataDesk Intl.
DataDesk Switchboard 159.



Easy Color Paint 2.0 (Creative Software)
With Easy Color Paint, you'll be creating graphics on your Mac in no time! It puts you in control of 17 tools, 256 colors, user-defined multi-colored patterns, gradient fills, multiple color palettes, resizable windows, adjustable fonts and brushes. Also, color inversion and blends, and "wacky coloring." It has bucket and lasso modes to simplify operation, rotation in 90 degree increments and FatBits windows for detailed editing. (graphics). **$47.**

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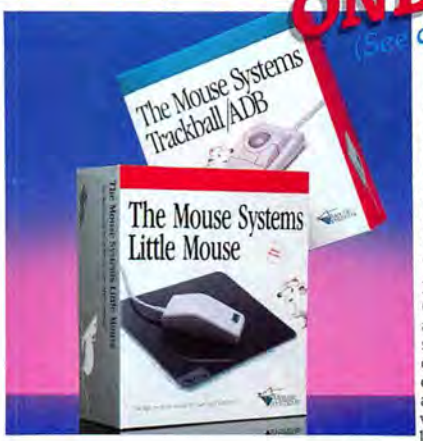
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The UnMouse 189.
Mouse Systems
TrackBall ADB 69.
Little Mouse 75.

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Gemini II SE 60 MHZ 2269.
Gemini Plus Kit 129.

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ProModem 9600 699.
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Supra
Supra Modem 2400 119.





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DrawingBoard Digitizers - 2300 A Series Digitizer's provide a large work area for high-precision drawing and drafting. Has a command area with template overlays so you can initiate all software commands directly from the tablet. Includes 16 button mouse with cross-hair cursor. Requires Mac with ADB port. (input/output). **DrawingBoard Digitizers 12x12 $319, 12x18 $609, 18x24 $1359.**

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Coda
Finale 2.5 549.
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Master Juggler 64.
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Alarming Events 85.
QuicKeys 2.0 97.



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QuickImage 24 Video Frame Grabber (Mass Microsystems)
Captures 24-bit full-motion color or 8-bit gray scale images. It fits in a single NuBus slot and automatically switches between NTSC and PAL signals. QuickImage saves images as PICT2 files, usable in desktop publishing, presentation, or video projects. Or, you can edit them with your favorite image enhancement software. Includes two inputs and accepts signals from many standard video sources, including VCRs, camcorders, and video disk players. It works with any Mac monitor and display card. (graphics). **$749.**





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Claris
MacWrite II 142.
Deneba Software
BigThesaurus 64.
Spelling Coach Pro 3.1 124
Lexpertise
MacProof 3.2.1 115.

FileGuard 2.5 (ASD)
"FileGuard stands out, especially for corporate users." *MacUser* May, 1990 Issue.
Protect your Hard drives and Partitions from unauthorized access (including security bypass with a system diskette), copying and erasure; Applications and Files/ Folders (including system folder) from unauthorized access, deletion, and/or illegal copying; Desktop (including system folder) from alterations by unauthorized users; Keep an eye on System Usage with the system users log which continuously tracks user/group activity. (security). **$139.** Office 5 Pack **$349.** Office 10 Pack **$579.**



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Figure 1: A Cost-Analysis Tool

Basis for cost analysis		Component costs	
Users	200	Laser printer	$4,500
Managers	2	Router	$2,000
Servers	2	Star hub	$950
Years	4	Network manager salary	$45,000
		File server	$3,500
		E-mail (per user)	$60
		Connectors (one per user)	$35

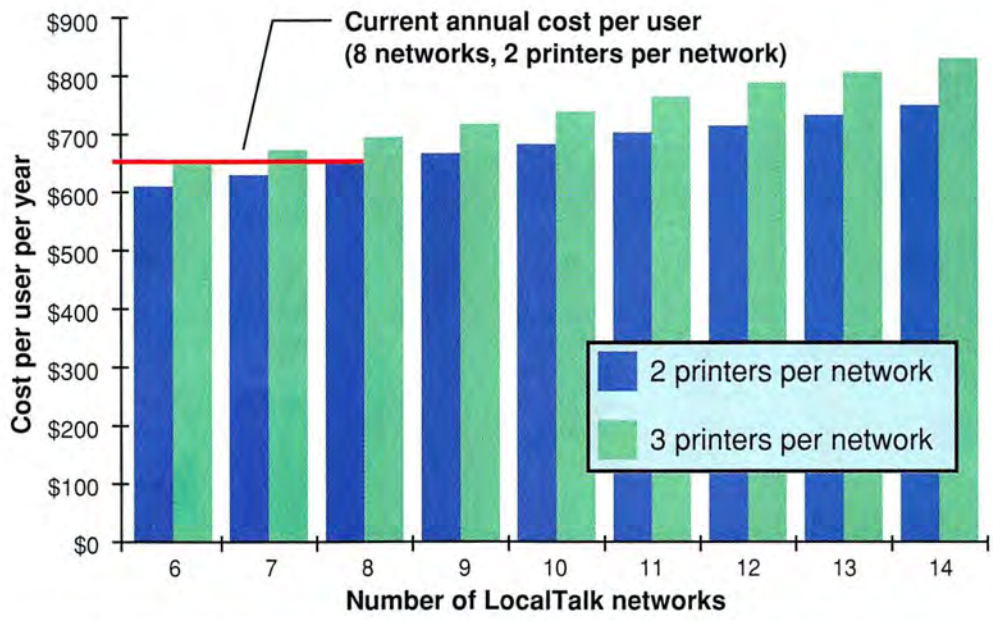


Figure 1: Start your network-cost analysis by entering basic information about your network and the cost of its components into a spreadsheet (not shown). Use these figures to calculate the annual cost per user. Then try changing one or two parameters. You can create a chart to help you see the effect of your changes. In the chart above, the number of LocalTalk work-group networks in the internet and the number of LaserWriters in each LocalTalk work group have been isolated as the two factors to vary. The chart shows the effect of varying these two elements by different amounts.

want to redistribute the users who are in eight LocalTalk networks into ten networks, it will cost an additional $30 per person per year. If you're having reliability problems and you want to change the wiring configurations to one device per port on the LocalTalk hubs, you'll have to purchase 16 more hubs, but doing so adds only $19 per person per year. (This alternative isn't shown in the graph in Figure 1.)

When you understand the costs, you can analyze them in relationship to other network-design values such as reliability or desired level of performance. Is it worth spending $19 per year per user — the cost of adding more hubs — to make your network more reliable and to reduce your network downtime? Is it worth spending this much money to speed up printing for everyone on the network? Posing the question in this way will get the attention of the bean counters who control your budget. They know how much even a single hour of lost productivity can cost.

Try calculating this for your network. How much does it cost to operate? What could you do differently? How much would that cost? What is the value of the improved design or new equipment to network users? How does the value you gain compare with the cost of upgrading? Build an analysis tool that works for you. It gives you a better understanding of what your options are and enables you to communicate this to others.



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Features	GatorBox	FastPath
AppleTalk-Ethernet gateway	■	■
MacTCP and IP support	■	■
AppleTalk Phase 1 and 2 support	■	■
SNMP and atalkad support	■	■
Compatible with GatorMail	■	■
Built-in AppleTalk tunneling over IP backbone	■	
Remote gateway status via Telnet	■	
Overnight replacement policy	■	
One megabyte of RAM	■	
File sharing (with GatorShare)	■	
Unix-AppleTalk printing (with GatorPrint)	■	
Suggested retail price	$2795	$2795

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"GatorBox offers the best blend of sophisticated IP and AppleTalk features." —MacWeek

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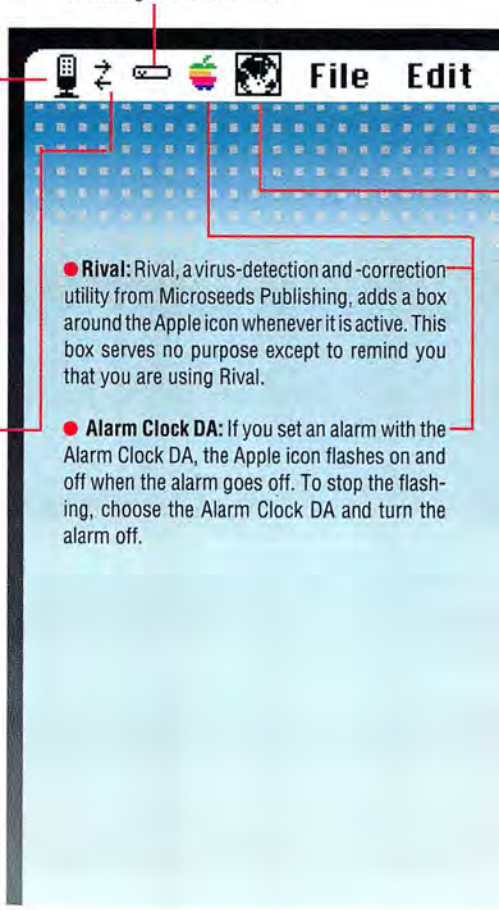
Secrets of the Menu Bar

Just how many tools can one menu bar hold? Here's a rundown on the incredible amount of stuff you can add to your menu bar and how it can help you get more out of your Mac.

By Craig Danuloff

Do you know what everything in the menu bar shown here does? The menu bar occupies a small part of the screen, but it's a popular place to put two kinds of utilities: those that extend or enhance the power of your Finder and those that add functionality to some (or all) of your applications. Although you'll never see a real menu bar quite this crowded, everything here is something you might consider adding to your Mac. At the very least, it's a good idea to know what these programs do in case you find them on somebody else's Mac.

● **Silverlining, In Use, DiskLight:** While working on the Mac, you may notice something flashing in the extreme left corner of the menu bar whenever you access your hard drive. This is caused by the driver that was installed if the hard drive was formatted by using Silverlining, a shareware utility called In Use, or Norton Utilities' DiskLight. Basically, these flashing icons or pixels replicate the activity of the hard-drive light that's found on the front of most computers and external hard drives. These lights let you know that your Mac is busy reading from or writing to the hard disk.



● **PopChar:** When PopChar is installed, clicking on the left edge of the menu bar pops up a list of every character available in the current font. This makes it easy for you to choose nonstandard characters. A selected character is automatically pasted at the current cursor location.

● **QuicKeys 2:** When you're recording a macro with QuicKeys 2, the Apple icon is replaced by the QuicKeys microphone icon.

● **AppleShare:** When you're connected to an AppleShare file server, a pair of arrows appears at the left of the Apple menu whenever your Mac communicates with the server. You might find your Mac "locking up" for a few seconds while you work and notice that the arrows appear at these times. This is because the Mac tends to check in with the AppleShare server even when you aren't accessing the server drive. You can disconnect from the server whenever you're working on the Mac and not using files from the remote server.

● **Rival:** Rival, a virus-detection and -correction utility from Microseeds Publishing, adds a box around the Apple icon whenever it is active. This box serves no purpose except to remind you that you are using Rival.

● **Alarm Clock DA:** If you set an alarm with the Alarm Clock DA, the Apple icon flashes on and off when the alarm goes off. To stop the flashing, choose the Alarm Clock DA and turn the alarm off.

● **Screen Savers:** You activate virtually every screen saver — including Pyro!, After Dark, Moiré, and Dimmer — by positioning the mouse at one of the menu bar's corners or at a bottom corner of the screen. The specific corner that activates the screen saver is usually set in the Control Panel.

● **Kolor, ClickChange, Personality:** On a color Mac, there are several ways to change the color of the menu bar and the text used in each menu. The freeware utility Kolor originated this ability, but two recent commercial utilities, ClickChange and Personality, have this ability along with dozens of other customization options.

● **Disk Doubler:** Disk Doubler has an add-on menu that appears at the Finder and lets you compress and decompress files or split files that are too large to fit on a single floppy disk.

● **Tempo II:** Tempo II is the Mac's most powerful and sophisticated macro utility. It lets you record and replay any sequence of mouse and keyboard operations. You can construct advanced macros using conditional branching, for/while loops, and so on.

● **SuperClock:** Probably the most common menu-bar addition to most desktops is a clock INIT. The latest and greatest in a long line of menu-bar clocks, SuperClock has constantly evolved over the years, and beyond doing its obvious job of conveniently displaying the time, it lets you customize the display font and color, displays the date at the click of a button, has a handy stopwatch function, and provides chime and alarm features through its Control Panel interface.

● **MultiFinder mini-icon:** Whenever a Mac is running MultiFinder (or System 7.0), an icon for the current foreground application is displayed near the right edge of the menu bar. This icon makes it easy to tell which application is currently in the foreground when multiple applications and windows are running. You can also switch from one application to another by clicking on the mini-icon.

Normally the mini-icon appears in black-and-white, but by using SunDesk or another icon-colorizing utility, your Mac can display full-color icons in the menu bar.



● **Earth, AppleEarth:** When you're running one of these INITs, a small rotating globe appears in place of the Apple icon. Editing the resources of these INITs with ResEdit or a similar utility lets you substitute almost any animated sequence for the rotating globe.

● **Magic Menu:** Provided with StuffIt Deluxe, Magic Menu is an extremely useful tool if you rely heavily on StuffIt Deluxe to compress and decompress files and if you use Microsoft Mail on your network. From the Magic Menu menu, which is available only at the Finder, you can compress or decompress files, mail files, or compress and mail files in a single click.

● **Windows:** This INIT adds a useful feature to the Finder by creating a new menu called Windows. This menu displays the name of each volume and folder window that is open at the Finder. Selecting the name of any window brings it to the front, saving you from having to dig through an on-screen mess.

● **MacroMaker:** Apple's free macro utility, MacroMaker, presents itself as an appended menu. MacroMaker is a useful tool for creating very simple macros but pales in comparison to QuicKeys 2 and Tempo II.

● **On Cue, HandOff II:** Both of these popular application-launching utilities appear in the far-right corner of the menu bar. They provide drop-down lists of available applications and documents. On Cue solved one of the most annoying aspects of the Mac's interface when it pioneered this technique several years ago, but it has since been eclipsed by numerous launching solutions such as those provided by DiskTop and MasterJuggler.

HandOff II provides application launching in addition to its original "end of the application not found" functionality. It's innovative in its support for hierarchical groups of applications and documents in the launching menu as well as its ability to change the bit depth of the monitor when an application is launched. (Incidentally, both of these utilities' menus can be configured to drop down from the far right, far left, or both corners of the menu bar.)

● **EZMenu:** This utility from CE Software drops menus down automatically as soon as your cursor touches the menu command — without requiring that you click the mouse button. Menus stay down until you click on a command, click elsewhere on the desktop, or point to another menu in the menu bar.

● **PopUp, PopIt!, PopWMenu:** Rather than bringing the mouse to the menu bar, these utilities bring the menu bar to the mouse — simply press the specified keys and click the mouse button and a vertical incarnation of your menu bar appears. These utilities present all menu-bar commands hierarchically.

● **RadiusWare:** Radius monitors give you the option of increasing the type size that appears in the menu bar. Another handy option they provide enables you to turn on tear-off menus.

Tear-off menus can also be created by a commercial utility called TOMinit.

How to Get a MacUser Index

If you're like most MacUser *readers, you save back issues. They're an invaluable reference source, but until now there was no easy way to look up old articles.*

By Ben Templin

In 1990 *MacUser* published 544 articles on nearly 1,000 products. That's approximately 700,000 words on more than 1,400 pages — a lot of information to thumb through if all you're looking for is the review of that utility that organized your System Folder. There's got to be an easier way.

There is. The MacUser/MacWEEK Index catalogs more than 7,000 articles that have appeared in these two magazines since 1987. It's available only through Zmac, the on-line service of *MacUser* and *MacWEEK*. There's no surcharge for using the index.

But I Hate CompuServe

If you don't want to deal with the CompuServe interface, you can download the MacUser Index as a HyperCard stack. To keep the size of the stack within reason, the MacUser Index carries entries for only 1990 and for *MacUser* alone. Although there will be quarterly updates to the HyperCard stack, the on-line version is updated monthly.

Any CompuServe subscriber can access Zmac by typing GO ZMAC at any ! prompt. If you don't belong to CompuServe, you can join Zmac by looking for instructions elsewhere in this issue.

To download the MacUser Index, get on Zmac and type GO DOWNLOAD. Download the file MUINDX.SEA.

The MacUser/MacWEEK Index lets you search by product, company, and topic. It delivers a citation with issue date, page numbers, title, and author. Searching by topic can sometimes reveal more articles than you'd care to deal with. For instance, the term *desktop publishing* yields 472 published articles since 1987. You can narrow a search to a smaller set by using the same three main search criteria. Further defining *desktop publishing* with the topic *layout* gets the count down to a more manageable 31 articles. The most recent articles are listed first. (Tip: If you want to separate the reviews from the news for a certain topic, then narrow by topic with the term *evaluation*. This keyword is used consistently to differentiate a review from a news story.)

Making the Most of CIS

Neither Navigator nor CompuServe Information Manager (CIM) deals well with CompuServe's infamous Terminal mode. But that's the mode you have to use to access the MacUser/MacWEEK Index. In Navigator's case, you have to add a manual tile and interact with the index in real time — a concept foreign to most Navigator users. Add a manual tile with a GO code of ZMC:INDEX. Consult your handbook if you have questions on how to use manual tiles.

CIM is not recommended for use with the index or with any of the Zmac databases. Although CIM is a good interface for forums, its implementation of its Terminal mode is too quirky to use with the index — there's a danger that you'll lose information with CIM, because of the way it captures data. However, if you must use CIM, keep the following tips in mind. The buffer allows for a maximum of only 500 lines, and the default is set at 100 lines. When you enter the Terminal mode, be sure to choose Setup from the Terminal menu. Set the capture buffer to the maximum of 500 lines, and then continue with your session. When you think you're near the 500-line limit, set the radio button at the bottom to Capture. Highlight the text you want to save, and choose Save Selection (Text) from the File menu. Do this often to ensure that you don't lose information.

If your primary purpose is to retrieve information from an index or one of the databases, then you're probably better off using a good terminal program.



The HyperCard version of the MacUser Index contains a year's worth of article references. It's available only through Zmac.



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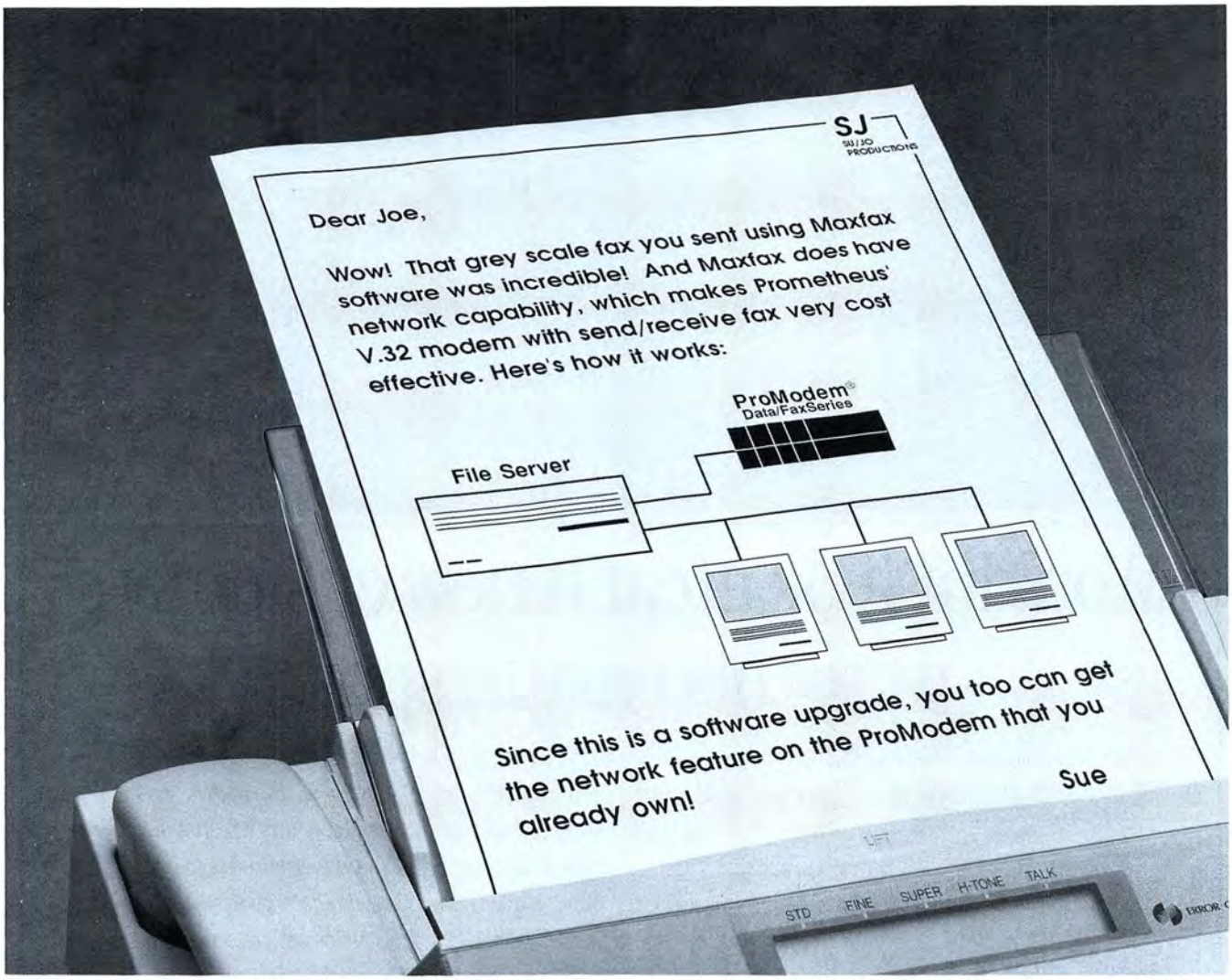
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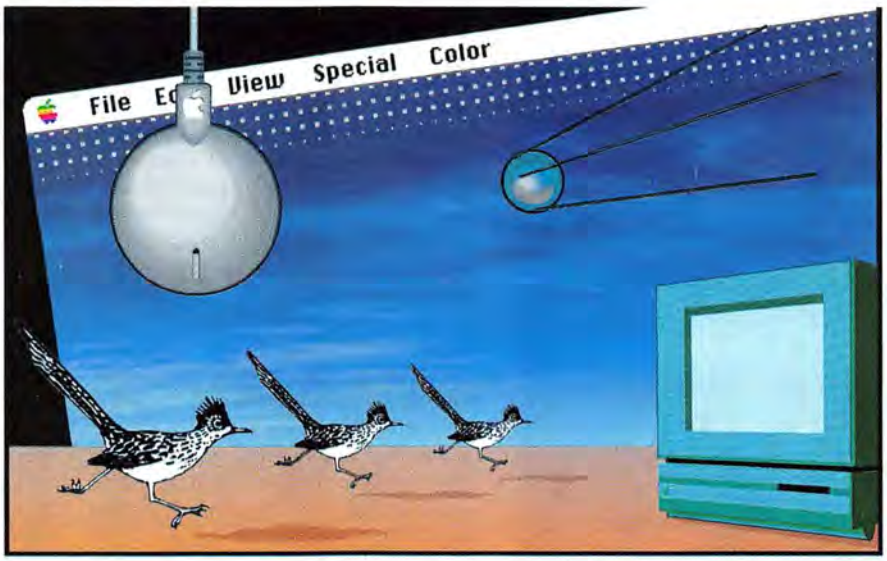
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Sound the Alarm

'Some stories are magical, meant to be sung.' — Paul Simon . . . and some stories are fantastic, meant to be narrated by Orson Welles.

By Michael Swaine



On October 30, 1938, Orson Welles and his Mercury Theatre of the Air presented a dramatization of the H. G. Wells science-fiction novel *War of the Worlds* in the form of a news broadcast. A nationwide panic broke out: Thousands of listeners were terrified, believing that the world had been invaded by tentacled aliens.

Reading a transcript of the broadcast today, it's hard to see what all the fuss was about. The story's time scale, for one thing, is incredible: In less than half an hour, a war is fought and lost — military battalions are deployed and destroyed, all in a matter of minutes. But the broadcast was believed, and there is psychological and sociological data that shows that not all the people who believed the Martians had landed could easily be dismissed as ignorant or credulous.

Several scholarly studies have examined the factors that led people to believe the broadcast. One thing seems clear: If the story had been published in the newspaper rather than broadcast on the radio, no one would have panicked. The medium of the message — the fact that people were listening rather than reading — made the audience more likely to respond uncritically and emotionally.

Apple believes — and wants us to believe — that some messages are meant to be heard rather than read. So it has given us sound. But is the gift magic or more like an alien invasion?

If all goes Apple's way, 1991 will be the year we get hooked on the magic of sound. As reported in this magazine last December, many application houses have released, or are about to release, new versions of their programs that give voice to our documents, make our data sing, and play our notes. Apple is supplying the instruments:

- The new Macintosh IIsi and Macintosh LC both feature built-in sound input.
- The IIsi joins the SE/30, IIci, and IIfx in supporting stereo sound output.
- Version 6.0.7 of the System software includes new sound-management support for applications.

Why Sound Off?

The response to the question, For what might you actually use sound? is a little repetitive. We hear the repeated chant about adding spoken annotations to documents: We will be able to "include voice comments in word-processing documents, presentations, spreadsheets, and E-mail messages," Apple informs us.

That has a nice ring to it, but it's not the only tune the Mac's new sound capabilities can play. There had better be some other uses for sound, because adding voice comments has some fundamental limitations.

First, sound files are large. Adding any appreciable amount of spoken data to a document dramatically increases its size. It's ironic that Apple is pushing this particular use of sound so hard, because the kinds of documents you would be likely to voice-annotate are also exactly the kinds of documents you'd be likely to send somewhere. Which, in turn, makes them exactly the kinds of documents you don't want to allow to grow too large. Whenever you

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send a file, regardless of the channel, size matters.

Granted, people do attach pictures to text documents and send them across networks and over phone lines despite the cost in file size and transfer time, but they do so in order to communicate objective content that would be difficult to communicate in any other way. The content supplied by a spoken comment attached to a written document would seem to be entirely subjective, and it's not clear what value users will assign, or should assign, to subjective connotations. A picture may well be worth a thousand words, but how much bandwidth does an attitude merit?

Second, existing applications that add sound capabilities will do so as an afterthought. Few applications were designed with sound in mind, and only those that were have any chance of really integrating sound in a significant way. We already have a good example of sound annotation in action: The NeXT machine has had that capability, with Lip Service, since its introduction. Lip Service lets you paste an icon into a document so that when the reader of the document clicks on it, the attached sound is played. That's it. Hardly what you could call media integration.

Third, existing applications are not usually time-aware. The perception of sound is more constrained by temporal order than is the perception of visual data: We can't skip around when listening. The applications that make the sound capabilities of the Mac really pay off will be ones that were designed with sound in mind, that make sound an integral part of what they do — and that means being time-aware. Farallon's MediaTracks and MacroMind's MediaMaker are examples of time-aware applications: They let you develop presentations or animations in which you design and control the sequence in which information is presented.

The Macintosh System software itself was designed with sound in mind, if not voice. The System uses sounds to signal various events. Up until System-software release 6.0.7, setting the speaker volume and changing the beep sound were pretty much the extent of user-level sound control that Apple provided. That's still the case, except that with the new microphone-equipped machines, you can record new beeps.

Tweaking Your Beeps

At present, the management of system sounds may have more practical value than any amount of voice annotation of spreadsheets. So the remainder of this column will cover the whys and hows of tweaking your beeps.

One good tool for manipulating system sounds is ClickChange from Dubl-Click Software. ClickChange is an INIT/cdev that you put into your System Folder; it allows you to manipulate many aspects of your desktop interface. I'll be talking about more of its features in next month's column, but this month I'll concentrate on the sound features.

When you invoke ClickChange from the Control Panel and select Sound-ClickChange from its options, you see two scrolling lists, one for sounds and one for events. The events with which you can associate sounds include key presses, key releases, the moment at which a key starts repeating, mouse-button presses and releases, disk insertions and ejections, system shutdown, the loading of ClickChange and the loading of the last INIT, any window update, and generic beeps. You can associate any of the sounds in your System file or any sound supplied with ClickChange with any of these events.

Two of the ClickChange sound choices

Puzzle Box

Wilmer, your coworker in the next cubicle, is always dazzling you with his knowledge of the Mac, but the other day he really made you question the soundness of your mind. You each had been working in your own space for hours when suddenly Wilmer's voice came ricocheting off the acoustic ceiling tiles that hang suspended above the hive of cubicles. You've got a bad SIMM in bank 1, Wilmer informed you, and on investigation this proved to be the case. Had Wilmer been in your cubicle? Or standing on his chair looking over the wall? How else could he know the state of your SIMMs without seeing your Mac II?

The best answer received before the arbitrary and unspecified cutoff date will earn its sender a coveted "I Beat the System" T-shirt.

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Sounds Like System 7.0

As long ago as last spring's Worldwide Developer's Conference, Apple demonstrated to developers the sound capabilities of System 7.0's Sound Manager. What the developers saw — or, rather, heard — was a demonstration of sound output, not of the sound-input capability that was to capture everyone's attention six months later at the introduction of the new low-cost Macs. But what the developers heard was impressive: Four tracks of sound playing simultaneously in the background (while other activity was in progress in the foreground) with no interruption or degradation of the sound.

Sound support in System 7.0 will include both an enhanced sound-output manager and a sound-input architecture, which ought to make it easy to develop sound applications or add sound to existing applications in a consistent manner. And the consistency should allow sounds to be cut and pasted like any other data.

Of course, much of the new sound capability is already here. The release of System 7.0 has been pushed back, at last report, to sometime in the first half of this year. But sound arrived sooner. (What is the sound of a company with its foot in its mouth? Something like "Moof!", I think.) The Mac IIsi has a monaural microphone and a custom sound chip with stereo-output capability. Version 6.0.7 of the System software includes the new sound-input support.

Allowing developers to add sound to applications quickly is important if Apple is serious about enabling users to move sounds between documents under System 7.0-savvy applications as easily as they can copy and paste graphics today. But it may well be that System 7.0's most important sound feature is the ability to play alerting, informative, or entertaining background sounds without obtruding into the screen real estate.

offered are not separate sounds. Randomly Selected picks a sound for its associated event at random from those in your System file — a disconcerting effect. And No Sound at All is a choice you would almost surely want to assign to some events — a key press comes to mind as a good example of an event you don't want beeping at you.

You can also set the speaker volume for each event, and you can export sounds to save RAM and import sounds from other utilities or applications. If you hear something you like in an application, you can use ClickChange to acquire and use it.

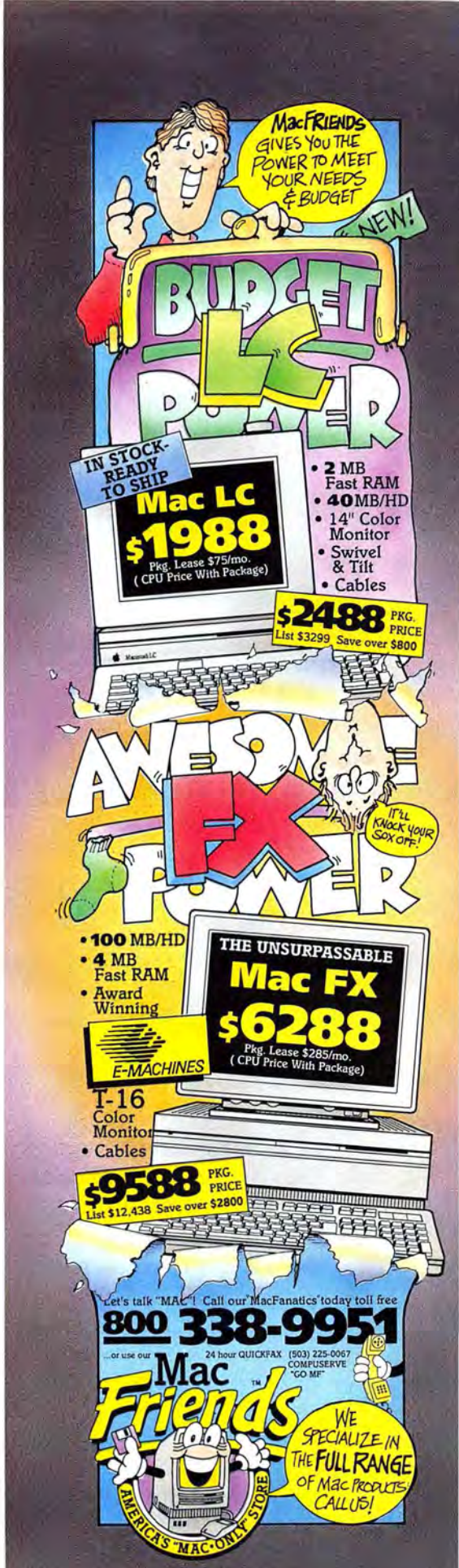
That's about all you can do with system sounds. Why, though — apart from the novelty of having your machine say "I like Spam!" when you insert a disk — would you want to mess with system sounds? Well, because the sounds are there to do a job and because you can improve the way they do it by making them more distinctive and meaningful. As the above list of events suggests, there are a lot of occasions for your Mac to signal to you, and there are times when it might be nice to know exactly what it's trying to say. If you sometimes have trouble with INIT conflicts, a distinctive sound when the last INIT loads might be informative, not to mention reassuring. Since you can adjust the volume of individual beeps, you can make the Mac beep louder when it really needs to alert you to a serious problem.

I use ClickChange because it's the most broadly applicable user-interface tweaker I've found, short of the overkill of ResEdit. But there are other beep tweakers. Sound Master, Bruce Tomlin's $15 shareware cdev, supports a different, and perhaps more useful, set of events: startup, restart, shut down, disk insert, bad disk, disk eject, disk request, key click, Return key, space bar, and generic beep. Another tweaker, MasterJuggler, lets you assign sound to nine events.

If you want to record your own sounds, you'll need one of the new microphone-equipped Macs or a third-party sound-input device such as Farallon's MacRecorder. In the future, all sounds will begin to conform to the AIFF sound format, but for now there are some incompatible sound-file and -resource formats. Sound resources are either Type 1 (HyperCard) or Type 2 (anything else), and the most common file format is the SoundEdit format. Richard Ettore's SoundMover utility converts among all the formats. (SoundMover and other useful sound utilities are available for downloading from Zmac and other shareware sources.)

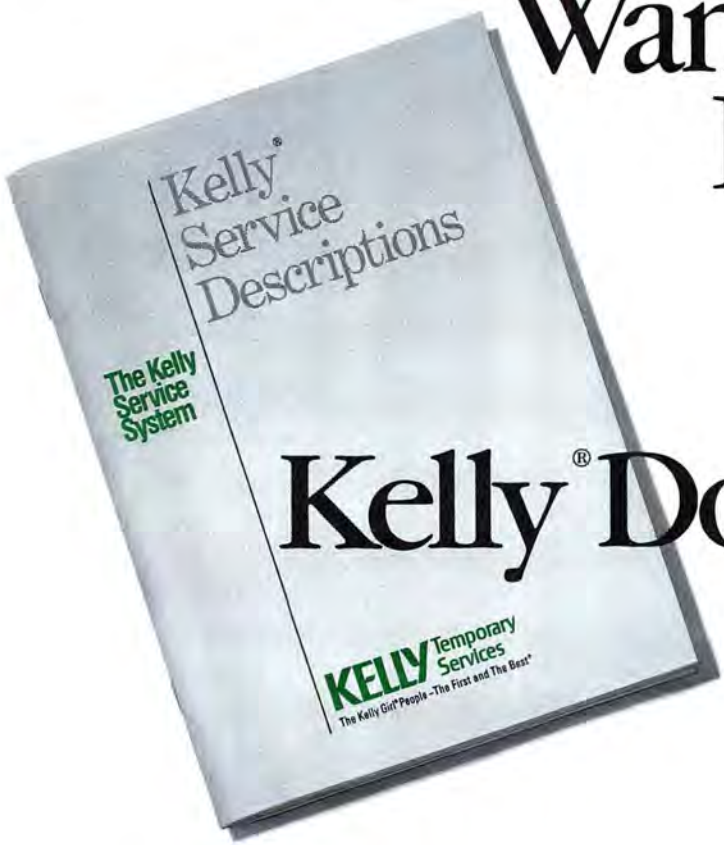
Orson Welles concluded the *War of the Worlds* broadcast with a reassurance that the show was just a Halloween prank, but the damage had been done. These were his last words on that broadcast: ". . . and if your doorbell rings and nobody's there, that was no Martian"

It was just your doorbell-imitating Mac disk-eject beep.



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Happy Birthday

Can an expert be wrong? No, but he might change his mind. After a year on the edge, it's time to look back with proverbially acute hindsight and set some records straight.

By Thom Hogan



It was in February of 1984 that the Macintosh first appeared to the public. It was in February of 1990 that I joined the *MacUser* crazies. And February is also the month when this country celebrates past presidents' birthdays. So I now proclaim this officially to be Birthday Month.

As befits a birthday, I have some presents for you: informative updates to pieces I wrote previously. Even if you haven't read the articles being brought up to date, I think you'll find some interesting thoughts, opinions, and ideas. If not, hey, folks — it's my birthday as a *MacUser* columnist, so lighten up!

Fax Facts

In the June '90 issue, I wrote that I wasn't too fond of the fax modems that I'd tried. At that time, I'd used the Apple Fax Modem, the Abaton InterFax 4800, and the Orchid 9,600-bps versions. I've since tried the Dove Fax and the faster Abaton (9,600 bps) with new software. Meanwhile, Apple has stopped producing its fax modem, owing to the number of problems with it.

The Dove Fax changed my opinion of fax modems. I now use a fax modem with only minor reservations. Why? First, the Dove Fax is inexpensive and small ($200 street price, and smaller than a paperback book). Second, it's well designed (it automatically powers up and down as you use it — no power switch to worry about). Third, the software that comes with it, although a bit clumsy, works as it's advertised to do.

The Dove Fax software, unlike Backfax and Abaton's INIT, doesn't seem to have any conflicts with either the hardware or the software I use. I no longer have problems with stutter faxes or extra-long transmission times because of error retries. It's easy to zip off a text-only fax without having to start up my word processor. Multiple user-designed cover pages are handled elegantly. On the other hand, I don't like having to use the Chooser to change the modem between data and fax modes. Addressing faxes isn't intuitive enough. And the process of creating a bit map to send to the fax is still time-consuming.

So here's how I'm using faxes these days: All incoming faxes are received by a dedicated fax machine. It's rare that I need to capture an incoming fax as an image for further processing, and dedicated fax machines are the most hassle-free way to capture incoming messages. I send outgoing faxes with the Dove Fax. Not only do I get better-quality images going out over my phone lines but I also save time since I don't have to print the fax and then feed the machine.

My new recommendation: If you send a lot of faxes and want to save some time, get the Dove Fax. It's less expensive than the Abaton and Orchid models, and it works better — at least in my tests.

Backing Up

Back up to July of last year, when I offered a set of bit-mapped fonts. As those of you who took me up on the offer found out, things

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177000,5200
Password:
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Agreement Number:
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didn't quite go as I'd expected. The master disk for the bit-mapped fonts got lost after I sent it to be duplicated. No problem, right? Just pull out the backup, and try again. Well, the backup in this case was an old 60-megabyte hard disk that had spent much of its time in the closet resting between backup sessions. Apparently I'd given it too much rest, because when I tried to boot it, it promptly gave every indication of having expired. The result, of course, is that I was never able to resurrect the disk of fonts I had offered. I received a lot of letters telling me that I should have backed up my system.

As a matter of fact, I've always backed up my work. What I learned from the font fiasco is this: A single backup is not enough. I had a backup. It turned out to be corrupted. So now what do I do?

I came up with the following list of statements that codify my beliefs regarding back-ups:

Data and programs should be backed up separately. Data is changed frequently and is irreplaceable, whereas programs are changed less often and can almost always be resurrected from the original distribution disks.

Backups should never be in special formats, if possible. Many backup programs use compression techniques to conserve disks and expedite the backup of a hard disk. I can't count the number of times users have been burned by these special formats. If for any reason you can't get your backup program to restore your files correctly, all of your precious data is no longer in a format that you can make any sense of. I've had a version of at least one well-known backup program get halfway through an 80-megabyte restoration only to quit because of some unknown and unreported error. I never was able to restore the final 36 megabytes of files, despite the computer's repeated efforts to help me. Thus, "Once burned, forever leery" is my motto here.

Multiple backups are necessary. Jerry Pournelle, a computer columnist for *BYTE* magazine, has long advocated WORM (write-once, read-many) drives. WORM drives have huge capacities (hundreds of megabytes), and because they can write a file only once, the way they handle changes to a file is to write a new copy of it to the drive. In essence, using one of these drives gives you the ultimate backup system: Every change to every file is immortalized. Jerry glosses over the problem with this method; that is, if anything happens to your gigabyte of data, you've lost everything. In other words, you still need to back up your WORM drive, which, given its size, is no small proposition.

What happens if your house/office burns down? In all likelihood, both your original and your backup copies are stored there. Or, there's the font fiasco I went through: What happens when the backup disk is faulty, for whatever reason? Enough said. Make multiple backups. Keep one in a facility separate from your computer (such as a safe-deposit box, your office at work, a fireproof safe, or a friend's house).

So how do I back up my system these days? Well, I don't use floppies. I use Bernoulli cartridges or Sysgen cartridges. Since these 45-megabyte media act like hard disks, I simply make Finder copies of my data folders. This takes maybe 10 to 15 minutes to accomplish. I rotate the backups so that I end up with multiple copies, albeit a few days different from one another. (I'm not opposed to losing a few day' work. It's losing all my work that I'm opposed to.) In the case of the source code for our software program, Tycho Table Maker, we copy the whole project onto multiple cartridges after each new version and keep them in three separate locations. Thus another important point about backups: The more valuable the data (i.e., the more it would cost you to replace it), the more careful you should be about the backup process.

Second Thoughts on ATM

When I originally wrote about Adobe Type Manager vis-à-vis the ImageWriter printer back in July, I suggested that you could do better by carefully choosing optimized bit-mapped fonts. By the time my nonendorsement of ATM appeared, Adobe was already shipping a new version (1.2) that corrected a few of my complaints about the original. In particular, version 1.2 rendered fonts better on ImageWriter printers than the first release did.

Well, Adobe has tackled ATM anew. The recently released version 2.0 solves virtually all the problems users have mentioned. The new ATM is faster — fast enough on a Plus or SE to finally recommend it — renders fonts on the screen more clearly in small sizes, and has yet more incremental changes that improve bit map rendering on printers such as the ImageWriter. I still wouldn't recommend that you use ATM with older (read: slow) machines that have only

What I learned from the font fiasco is this: A single backup is not enough. I had a backup. It turned out to be corrupted.

1 megabyte of memory, but if you haven't upgraded your memory by now you're definitely in the minority and must be happy with what you've got. And, of course, the better the resolution of the print device, the better the job that ATM will do. I use ATM regularly with both my DeskWriter and (not-so) SilentWriter laser printer. Because the new version builds bit maps so much faster than the original, I've also been able to cut my font-cache size down from 512K to 128K and still get satisfactory performance. In short, I'd now recommend ATM to all Mac users who use more than one or two basic fonts, no matter what printer you have.

But despite the kudos I've just heaped on Adobe for ATM, it's time someone took the company to task for being a major System Folder polluter. When you use ATM, you also have to deal with two types of font files: bit-mapped and outlined. The bit-mapped files are used for screen display, and the outlines are used to build odd sizes for the screen and to create the fonts for the printer, if necessary. Unfortunately, Adobe hasn't done its homework and requires that these files be in the top level of the System Folder. You can't bury them in folders within the System Folder; they have to be out there with everything else. I now have 35 outline files cluttering my System Folder. If I were to follow Adobe's suggestion and use its Font Porter utility to load the bit-mapped files into the System, I'd have 66 more font files in my System Folder. Of course, MasterJuggler and Suitcase II can help solve this problem, but frankly, I'd rather have Adobe get its act together.

Claris started down the right track by making all its products use the same set of dictionaries and file filters, all of which reside in a folder named Claris — which, in turn, resides within the System Folder. I strongly suggest that Adobe do the same. Indeed, I'll go further than that and propose a generalized organization that all software companies should follow with regard to the System Folder (if you agree, make a copy of this part of the column and send it to your favorite violator):

1. Any company that produces multiple products should follow Claris' example and attempt to reduce the needless duplication of files. Each company should require only one dictionary, one set of file filters, and so on, and all of these should be placed in an appropriately named folder within the System Folder. Claris gets an *A* for pioneering this, Aldus gets a *B*– for almost getting it right, and Microsoft and the rest of the world get an *F* for making our life a file-organization hell.

2. Products that use several data files, as ATM does with font files, should place these files within an appropriately named folder within the System Folder. Further, to get a program to recognize a new data file, all you should have to do is drag the file to that folder. Apple gets an "incomplete" here; System 7.0 contains a good deal of this organizational help, but as I write this, it's only just made it to beta testing. Adobe, of course, gets an *F*.

3. Temporary files should be temporary. Here Microsoft gets another *F*, while virtually every other company passes. The folks at Microsoft must be addlepated. I've seen as many as 30 Word Temp files in my System Folder! One reason Microsoft applications don't erase temp files is that these files may be the only place to find lost data after a crash. Fine. It's a noble gesture to give the user a chance to recover lost data. But Microsoft got lazy with implementation. Try these ideas, folks: If an application detects a temporary file (or files) on startup, it should ask the user whether the program should attempt to recover data from them or delete them. Add a menu command, Delete Temp Files. Track usage — if users edit and save a new file without touching the old temp file, it's a good bet that they're not interested in what's in that file.

4. If a program saves preferences in a file, it should first look to see if a folder named Preferences exists in the System Folder. If so, it should put its preference file there. If not, it should create the folder and put its preference file there. No one, including our own Tycho Table Maker, passes this test, because this is the first time anyone's suggested it.

Four little logical rules to live by. I've made a copy of these rules and forwarded them to the programmers here at Macreations. Expect all future products and updates from my company to live up to these rules. If you have others, I'd like



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to hear about them. In the meantime, applaud Claris, and heckle Adobe and Microsoft.

Mac Crashes

In October, I answered several often-asked questions and tackled the subject of customer support. In passing, I noted some of the most common causes of system crashes. One cause that I didn't stress enough is improper installation of System software. Never, ever, drag new System-software components from a floppy to your boot disk. Always use Installer to update your System. To this I would add that I've seen so many cases where using Apple-supplied (read: store-bought, shrink-wrapped copies) versions to reinstall a System has resulted in a crash-free system that I have to wonder exactly what's going on out there in userland.

One thought: If you installed a System on a Plus or SE and then upgraded to a Mac II, simply plugging in your old hard disk without updating the System, you may have problems. Disk drives that are shared among various Mac models (as might be the case when you move a drive back and forth between a machine at home and at work) should always be formatted on the lowest-level machine and have their System installed on the highest-level machine. Multiple System Folders on a boot disk are an absolute no-no. And updating only part of the System (perhaps dragging the new Finder, System, and MultiFinder icons across drives) is also a no-no. Trying to run System 6.0 and 7.0 from the same drive is also to be avoided (see my September '90 column).

That's All, Folks

That's it for this month. I'd like to thank all of you who took the time to write to me during the past year — a veritable flood of mail came after my October column on (the lack of) Apple support. I do try to answer many of your letters, but it would make my life easier if you would supply a self-addressed, stamped envelope.

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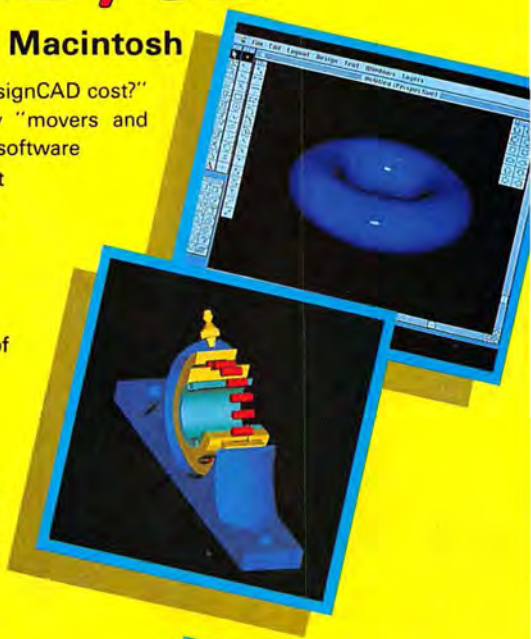
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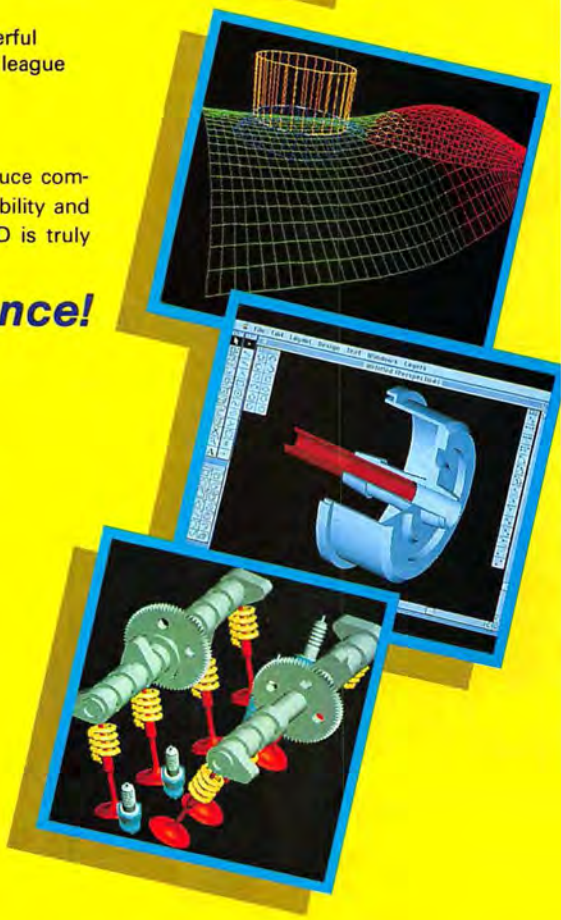
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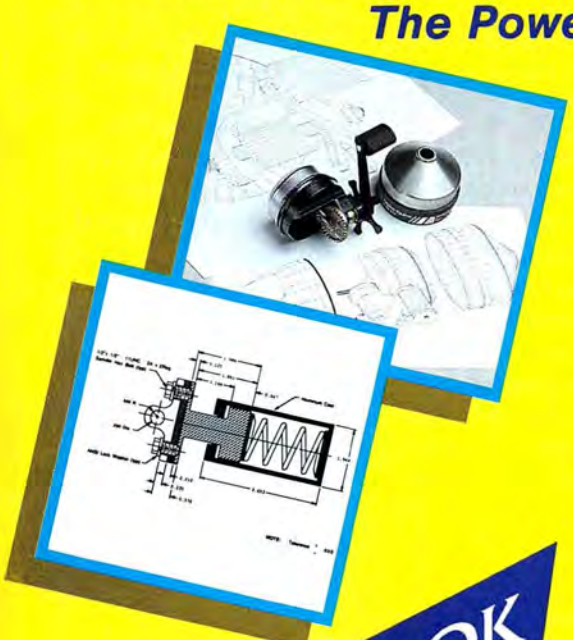
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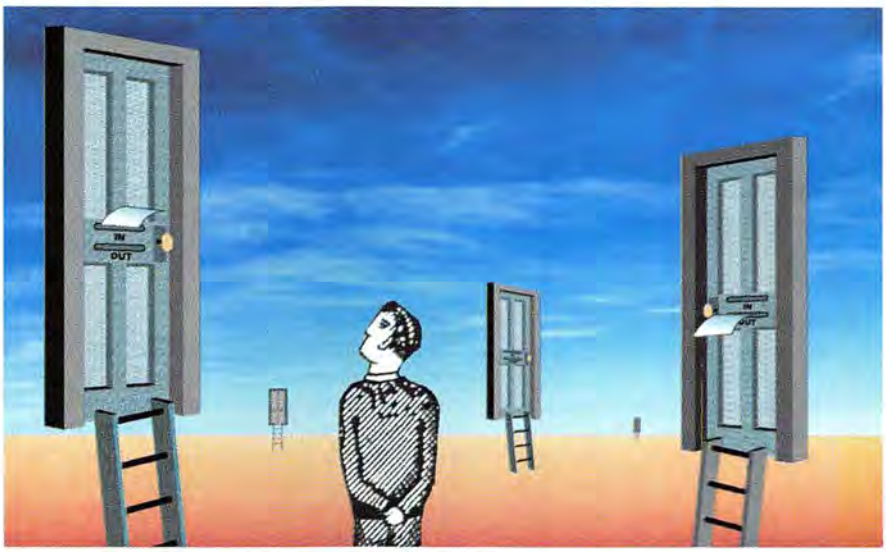
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What Comes After C?

Object-oriented programming is more than a catchphrase — it's a technology that, sooner or later, anyone who wants to program a Mac will have to reckon with.

By Kurt W. G. Matthies and Thom Hogan



If you've been following this column for the past year, you've had the chance to learn a great deal about using the Macintosh Toolbox and Symantec's THINK C to write applications. Now it's time to talk about a rapidly emerging technology that threatens to render most of what we've learned old-fashioned — if not obsolete.

Advocates of OOP (object-oriented programming) make lots of claims: more-bug-resistant code; shorter development time; less programming drudgery; and even, in one case, more fun at work. The potential for such advances in the state of the programmer's art is too important to ignore. And if what we're hearing from Apple is true, object-oriented programming will become the standard for Macintosh development during this decade.

This news should come as no surprise to dedicated Apple watchers. Apple's research-and-development arm, the Advanced Technology Group, has been at the forefront of object-oriented technology for years. Out of the Advanced Technology Group came Clascal, an object-oriented Pascal implementation for the early Lisa computer, and MacApp, a powerful set of application-building object classes written in Object Pascal and usable with C++ as well. Some people go so far as to say that everyone who wants to program a Mac will need to know MacApp someday. We'll be looking at it in detail in a later column. In the meantime, it's a safe bet that the programming interface to future System-software releases will be object-oriented.

If OOP can deliver all it promises, then Apple's commitment to it is good news. But where will all the object-oriented programmers come from? Of the thousands of programmers who currently work on the Mac, most (ourselves included) are still using procedural techniques. Will our hard-earned experience become obsolete?

Before we can answer that question, we need to understand just what object-oriented programming is and what makes it different from our current programming methodology. Perhaps the best way to start is with an example.

You're probably familiar with a dictionary data structure; it's common to many programming tasks. A dictionary consists of name-value pairs, ordered (depending on the implementation) in various ways — the details aren't important for our example. What's important is that each name in the dictionary has an associated value. For instance, the name *Evan* might have a value of 7, *Jay* a value of 39, *Catherine* a value of 194, and so on.

Two basic operations are performed on a dictionary. One operation, *put*, causes a value to be associated with a name. The other operation, *get*, returns the value that is associated with a name.

How you implement this dictionary and how it does its work depends on your programming orientation. In a traditional programming environment, you would probably write procedures that directly accessed the dictionary. Certainly, given a *handle* (Apple's word for a pointer to a master pointer) to the dictionary as well as a description of the data

structure, you could write code that could search the dictionary or add a new entry to it.

This sort of direct manipulation of data isn't part of the object-oriented-programming methodology, however. In an object-oriented environment, the dictionary is an *object* — a composite of both the dictionary data and the routines that access it. The data is *encapsulated* within the object, and access to the data by routines outside the object is prohibited. The only way to perform the get operation on the dictionary is to send the get message to the object.

A New Language

Object-oriented methodology has its own vocabulary. In object-oriented-programming lingo, five magic words — *object, method, message, class,* and *instance* — are used to discuss how a program works. Primary to OOP is the object, which has two parts: some private variables and a set of subroutines that use those variables. These subroutines are the object's methods. Our dictionary example has two methods: One performs the get operation; the other performs the put operation.

You write the body of a method exactly as you would a subroutine in your chosen language. There is no syntactical difference — a method looks identical to a procedure. The difference lies not in the methods themselves but in how they're executed. Object-oriented programmers don't talk about calling a function the way that procedural programmers do. Instead, they send a message to the object, which really amounts to the same thing: The method is executed.

A Class Act

Another similarity between OOP and procedural programming is the idea of object classification. The object-oriented term *class* is similar in meaning to the term *type* in procedural programming. All objects belong to a class, just as all variables have a type. In OOP, classes are hierarchical, and all other classes are built on the root class, just as in procedural programming a derived type in Pascal or C is based on a fundamental data type. All object-oriented-development systems come with a set of base classes, in addition to the root class, that you can use for boilerplate objects.

To complete this object-oriented primer, we'll add that objects are not declared (as types are in procedural programming) but are *instantiated.* This process is similar to allocating a data structure on the heap, except that the **new** message, which is used to instantiate an object, also associates the methods of the particular class with the new object.

Given all the similarities between object-oriented and procedural programming, we hope we've allayed any fears you may have about technical obsolescence. But does that mean you're now ready to sit down and write an application with the THINK C class library or MacApp? Probably not. There's a mental adjustment you'll have to make.

Object-oriented programming requires a new mind-set. First, you don't sit down and write an application anymore. The shell of the application is usually already

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written for you — it comes with the development system. What you need to write are those parts of the application that make your program different from all others. For example, the contents of your application's windows or the format of its data files will be unique to your application, so you'll have to write the methods that draw the window contents or write the data files.

Don't Call Us

You won't be calling those methods from your program either: The shell will be calling you. Remember, the relationship among objects is now that of client/server, and your code is the client. It's a pretty easy life that your code will be living from now on. As an object, occasionally you'll get a message from the shell to draw yourself or write yourself to a file, but most of the time, you'll be in dark RAM somewhere, with nothing to do.

It's a difficult transition for some programmers to make. Whereas in a procedural environment, they controlled every aspect of the program, now they've been demoted, so to speak, to writing only a specific corner of the application. The experience has been likened to "sitting in a closet." The analogy goes something like this: You (actually, your code) are in the closet. The shell is busy about the house, rooting around in the heap and answering events. Occasionally, it slides a note, as a message, under the closet door. You don't know where the message came from or why it's there, but you perform the requested task anyway and pass the result back under the door in another message. Then you go back to waiting.

An Object-Oriented Library

There's been an avalanche of new books on object-oriented programming. Here's a small bibliography of good texts, both old and new.

Cox, Brad J., *Object-Oriented Programming — An Evolutionary Approach* (Reading, Massachusetts: Addison-Wesley, 1986). Great on theory but covers Objective C, which isn't very useful for the Mac. Nevertheless, this is a classic in the field and worth reading.

Goldberg, Adele, and David Robson, *Smalltalk-80 — The Language* (Reading, Massachusetts: Addison-Wesley, 1989). Smalltalk is the mother tongue of object-oriented programmers. Great insights on the implementation of an object-oriented language.

Schmucker, Kurt J., *Object-Oriented Programming for the Macintosh* (Indianapolis, Indiana: Hayden, 1986). Covers MacApp 1.0 and Clascal. Was the definitive text on object-oriented programming for the Mac until the following book was published.

Wilson, David, Larry Rosenstein, and Dan Shafer, *C++ Programming with MacApp* (Reading, Massachusetts: Addison-Wesley, 1990). An entertaining, well-written book. If you're interested in either MacApp or C++, get this one.



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What do we programmers gain to compensate for this loss of control? As with most modern conveniences, more leisure time. First of all, we save time by not having to write as much code — the shell comes with the environment. Second, we spend less time maintaining the code. Shell code that's not ours is code we don't have to fix. Even if you already have a shell of your own, chances are that it contains a bug or two. Given a choice, we'd rather have an engineer at Symantec or Apple fix bugs than do it ourselves.

Will the world need fewer programmers? We don't think so. In our experience, the available work expands to occupy the number of available programmers. We don't think we'll go the way of the dinosaurs, but we will need to change our thinking. For some, object-oriented programming will simply make sense, and the transition from procedural programmer to object programmer will be an evolutionary one. For others, the migration process will require more effort. But whether you find it easy or not, the time to begin this re-education is now.

A Better Way

In our column on the Standard File Package ("Let's Get Lost," September '90, page 329), we used a static variable, **sSFProcFirst**, as a flag in initialization of radio buttons in the hook procedure. Since then we've heard of a better way to detect the first time in the procedure, from Nick Kledzik, the engineer in charge of standard-file development at Apple. It seems that the Standard File Package gives you a chance to do a one-time initialization in the hook proc. The package calls your hook proc with the item set to –1 just before it makes the dialog box visible. Using this knowledge, we can restructure the routine as shown in Example 1.

Example 1

```
pascal short hookProc (short item, DialogPtr theDialog)
{
    /* local vars here */

    /* get the radio button handles */

    switch (item)
    {
        case -1:
                /* initialize radio buttons */
                break;
        /*  other cases */
    }
    return (item);
}
```



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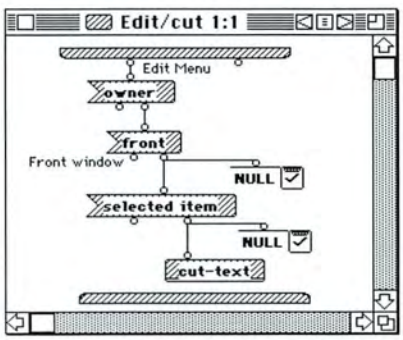
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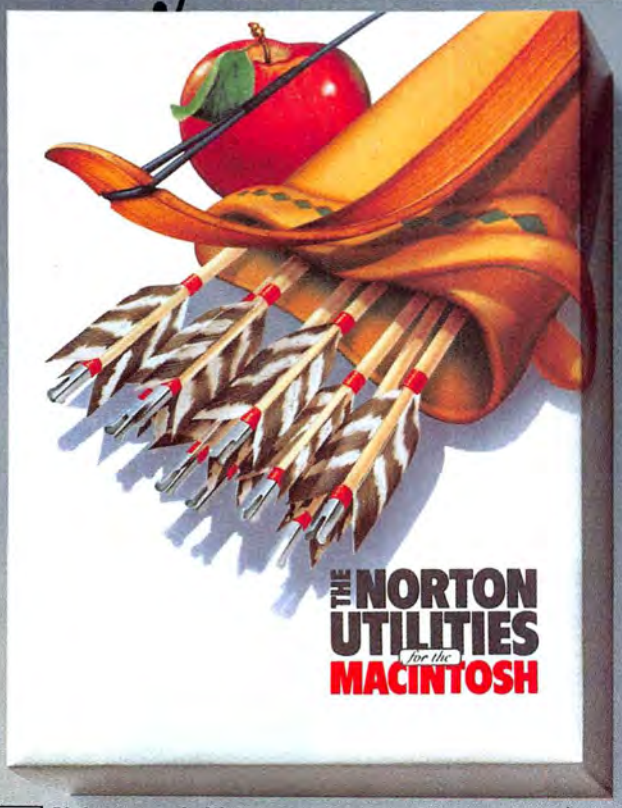
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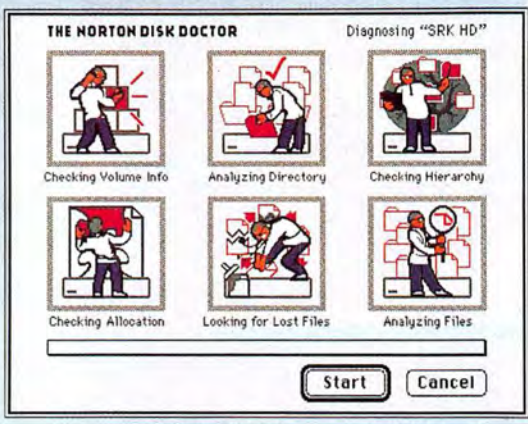
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Compiled by Gregory Wasson

TypeStyler

To use regular fonts that you've converted into TypeStyler SmoothFonts, you must have the original corresponding screen fonts installed in your system for TypeStyler to recognize them. But if you've created several SmoothFonts, it can be inconvenient to remember to install all the appropriate screen fonts. It's easier to install the necessary screen fonts right into the SmoothFont suitcase.

Here's how to do it:

After you've created your SmoothFont in the usual way, start Font/DA Mover. Close both windows. While holding down the Option key, click on Open; then select your SmoothFont file. In the second window, open the original screen font's suitcase. Now copy the original's 18-point screen font(s) into the SmoothFont file, and then quit Font/DA Mover. As long as the SmoothFont is available, TypeStyler will make use of this embedded screen font without your having to install it in your system.

Gordon Pritchard
Vancouver, BC
Canada

FreeHand 2.0

Here's a simple and economical tip for creating editable font outlines with Aldus FreeHand 2.0. Choose the text tool, and click anywhere. Set the text size to the largest size that you have bit maps for (if you have Adobe Type Manager, then the sky's the limit), and type the character(s) that you want. As I have ImageWriter LQ font sizes in Helvetica and Times, I use 72-point type. Once the text is on-screen, simply choose the tracing tool and auto-trace the text. FreeHand's auto-trace tool treats the text as an ordinary bit-mapped object. As with any tracing, you have to play with the auto-trace controls, but with large screen

Tip of the Month

SuperPaint 2.0

If you don't have the resources and memory to use Adobe Type Manager but still want to print out smooth-looking fonts at large point sizes on an ImageWriter, here's a tip for SuperPaint users that will help do away with those jaggies.

1. Open SuperPaint 2.0, and type your text in the paint layer in the largest point size you have (12- or 14-point works well).

2. Select the text with one of the selection tools.

3. Go to the Paint menu, and choose New SuperBits. In the resulting dialog box, select 300 (LaserWriter) for both the Horizontal and the Vertical measures. Select Smooth from the bottom of the dialog box as well. Click on OK.

4. Press the Delete key to delete the original text. The new SuperBits version will remain in the background.

5. Switch to the Drawing layer. Click on the New SuperBits type to select it.

6. Pull down the Transform menu and choose Scale Selection. Select the scaling factor you want (400 percent of 12-point type would result in 48-point type) for both the Horizontal and the Vertical dimensions. Click on OK, and the new smoothed type will appear in the large display point size (see Figure 1).

Stanley Wu
Wilmore, KY

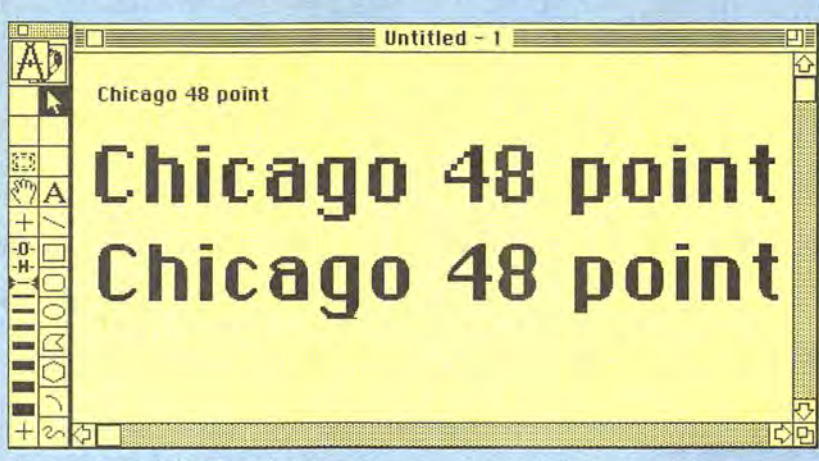


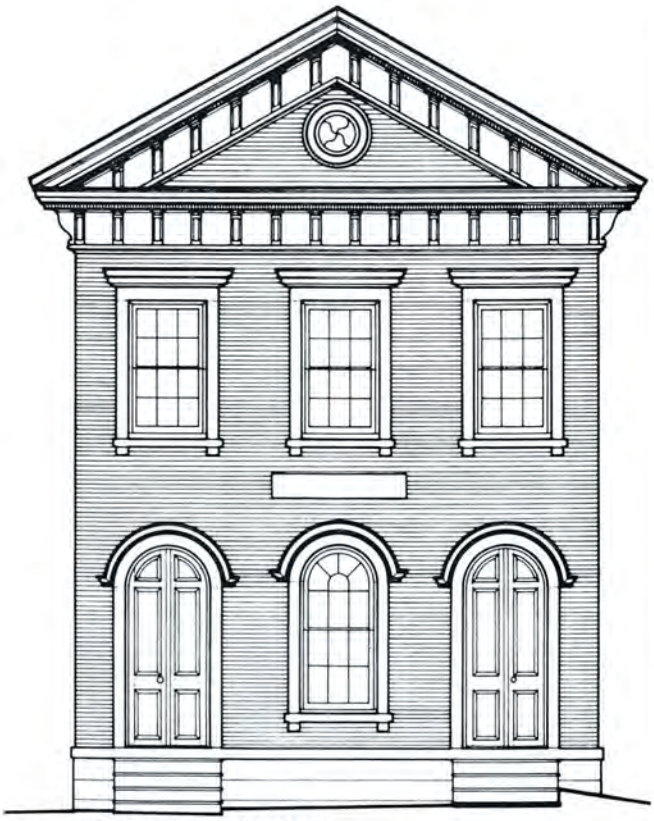
Figure 1: SuperPaint's SuperBits feature lets you create smooth display type (bottom text) when the regular screen display (top text) would be too jagged.

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Figure 2: An inexpensive and easy way to get editable font outlines is to use FreeHand 2.0's auto-trace feature to trace a screen bit map.

fonts, you can get very good outlines that require only minimal touch-up (see Figure 2).

Kenneth Trammel
St. Louis, MO

Switch-a-Roo 1.6

Switch-a-Roo 1.6 is one of the most useful FKeys available for the Mac II. If you need to switch between more than two screen depths, however (because you have a 24-bit monitor, for instance), the FKey will come up short. If you need to switch among 2, 16, 256, and 16 million colors often, you can modify Switch-a-Roo to allow two copies of the program to run at the same time. Here's how:

1. Make a copy of Switch-a-Roo 1.6.

2. Using ResEdit, select the copy of the FKey. First, use the Get Info command to change the ID to a number other than 9 that your system isn't using currently.

3. Next, open the file and scroll down to byte 2417. In the ASCII translation of the hex code, you will see *Roo File*. Change this filename to something that uses the same number of letters (for example, *Row File*).

4. Save the file, and install it into your system, using ResEdit, or load it with Suitcase II.

This modification will make the two copies of Switch-a-Roo run concurrently, with each assigned to a different keystroke. You may want to make one copy switch between 2 and 256 colors and have the other switch between 16 and 16 million colors. Even if you have to switch among only three screen depths, it's still easier to have two copies running concurrently than to go to the Monitors cdev or to call up the full screen to reconfigure Switch-a-Roo. In addition, you can assign these FKeys to the function keys on the extended keyboard, so any screen depth is no more than one or two keystrokes away.

Andrew Mellin
Durham, NC

Word 4.0

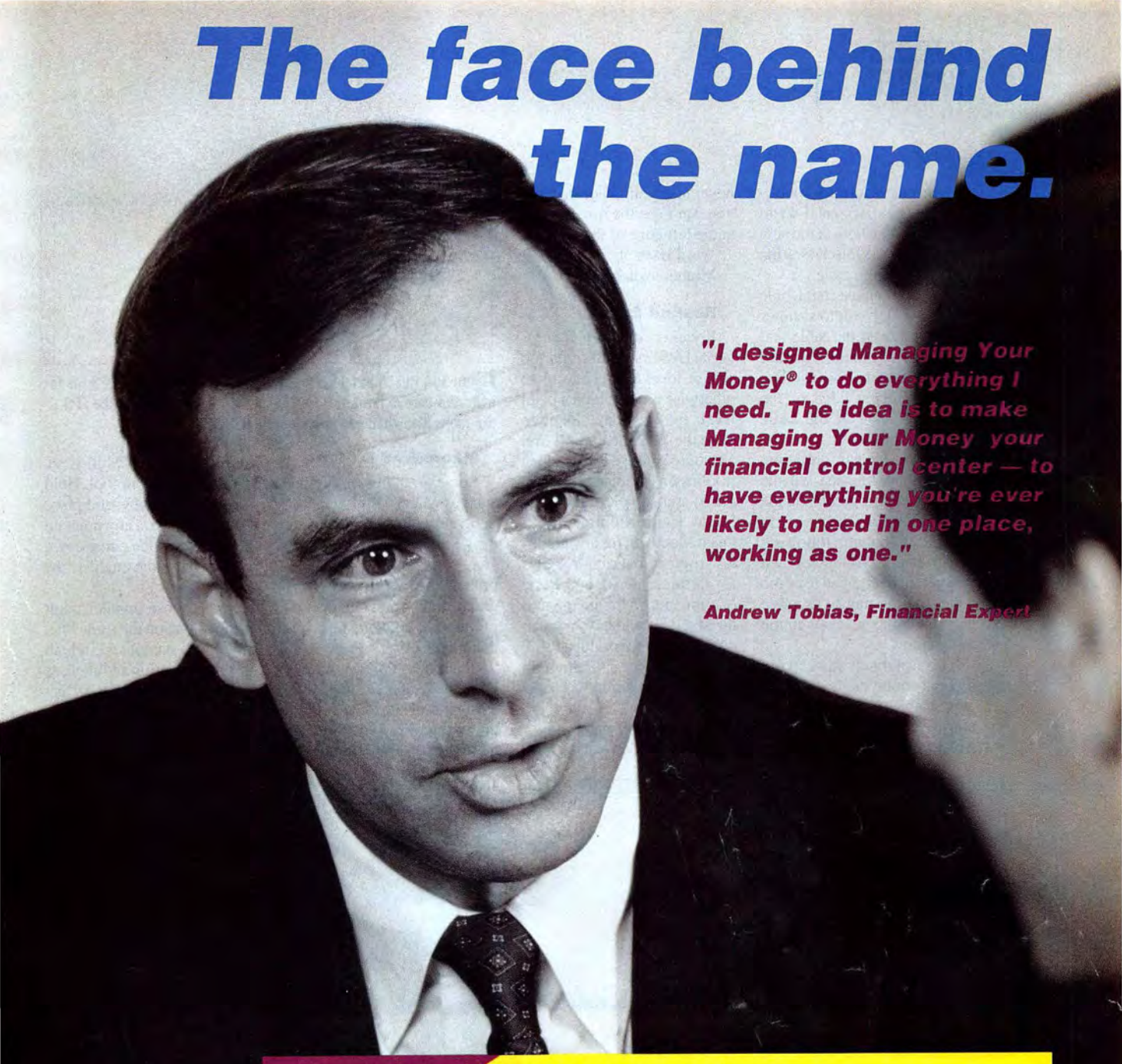
Here's a tip for creating full-page landscape-oriented (horizontal, not vertical) tables in Microsoft Word when using a small-screen Mac. This tip avoids the constant (and painfully slow!) screen redrawing that occurs when the cursor moves past the edge of the currently visible portion of the table.

1. Create your table. After you've created the column headings and table layout, use the Insert Row command to specify the number of rows.

2. Resize the window you're working in so that it fills the entire screen horizontally but only half of the screen vertically. Place the window at the top of the screen.

3. Now open a second window for the table; don't split the window you're working in — open a new one. Resize the new window so that it fits just

The face behind the name.



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underneath the original one.

4. Use the horizontal scroll bar to shift the view in the new window so that you can see the right edge of the table.

Now you can see your whole table — the top window shows the left edge of the table and several of the columns toward the middle; the bottom window shows the right edge of the table and some of the same middle columns.

Enter the table information. When you've finished with the last fully visible column in the top window, use the mouse to move to the column following it in the bottom window. When you get to the right edge of the table, use the mouse to move back up to the next row in the top window.

This is a much quicker and more accurate method of creating a table — you never have to wait for the screen to redraw while you're typing, and you never lose your place because you can't see the row headers at the left edge of the table.

Ward Barnett
Minnetonka, MN

ResEdit 2.0bX

If you want to turn your favorite EPS image into a startup screen, for example, or want to otherwise process it on a pixel level, try ResEdit. Use it to open the EPS file. You'll find a resource of type PICT. Open it. Click on the image (see Figure 3) and copy it to the Clipboard (with Command-C). Open MacPaint (or any graphics program that can save files as startup screens), and Paste (Command-V) the image into the MacPaint window. You can do this even if the original PICT image was in color — although it will be converted to black-and-white.

Dominik Hoffmann
Hamburg, Germany

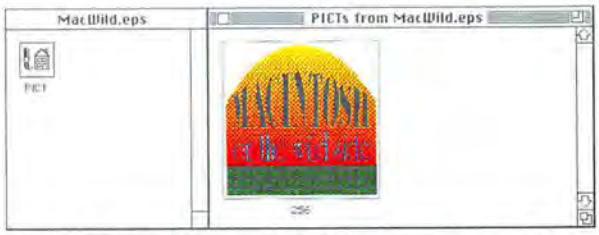


Figure 3: A ResEdit trick converts the PICT resource of an EPS file to a startup-screen format. Here's what the PICT resource of the EPS file looks like when you open it in ResEdit 2.0.

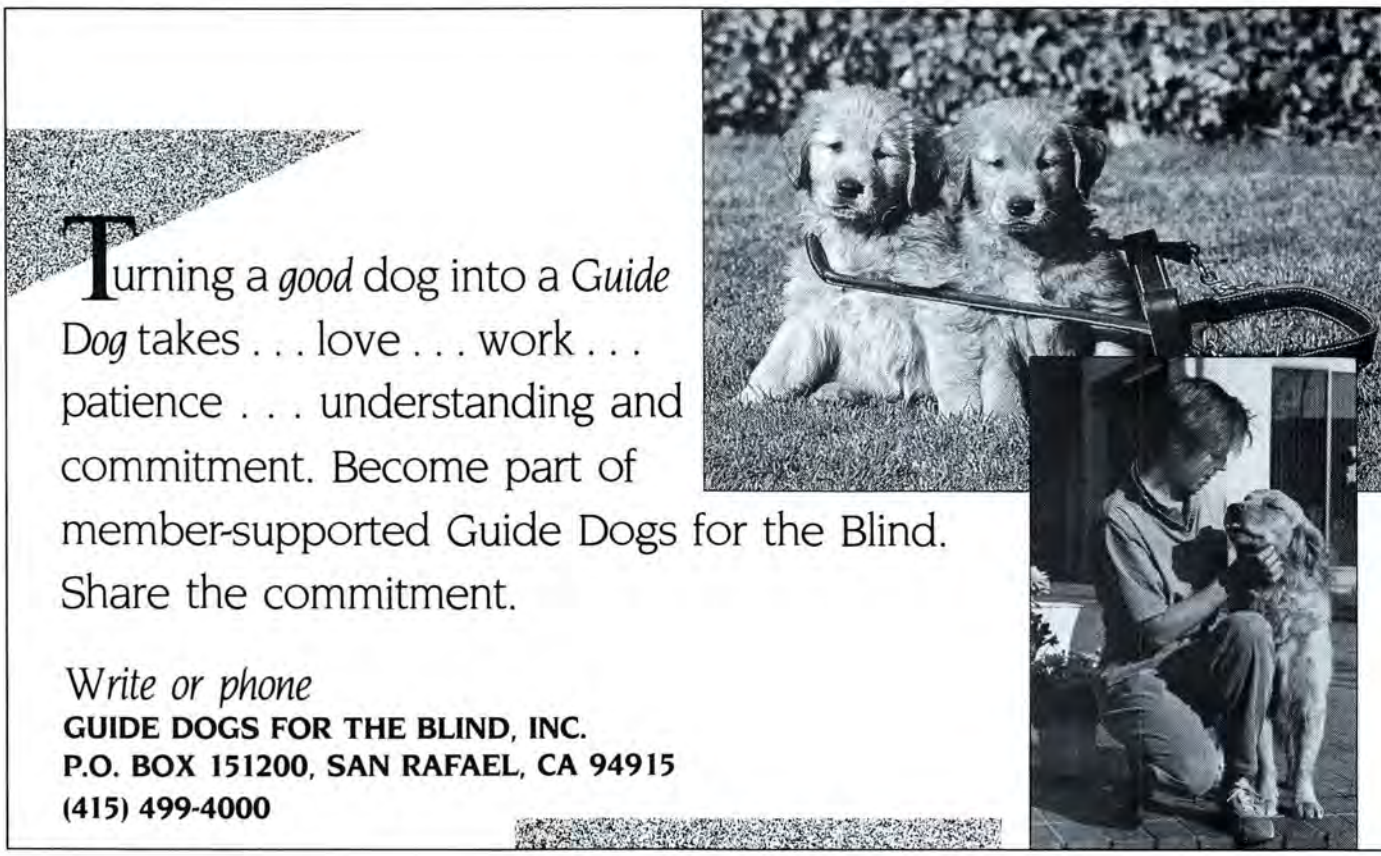
MacroMind Director

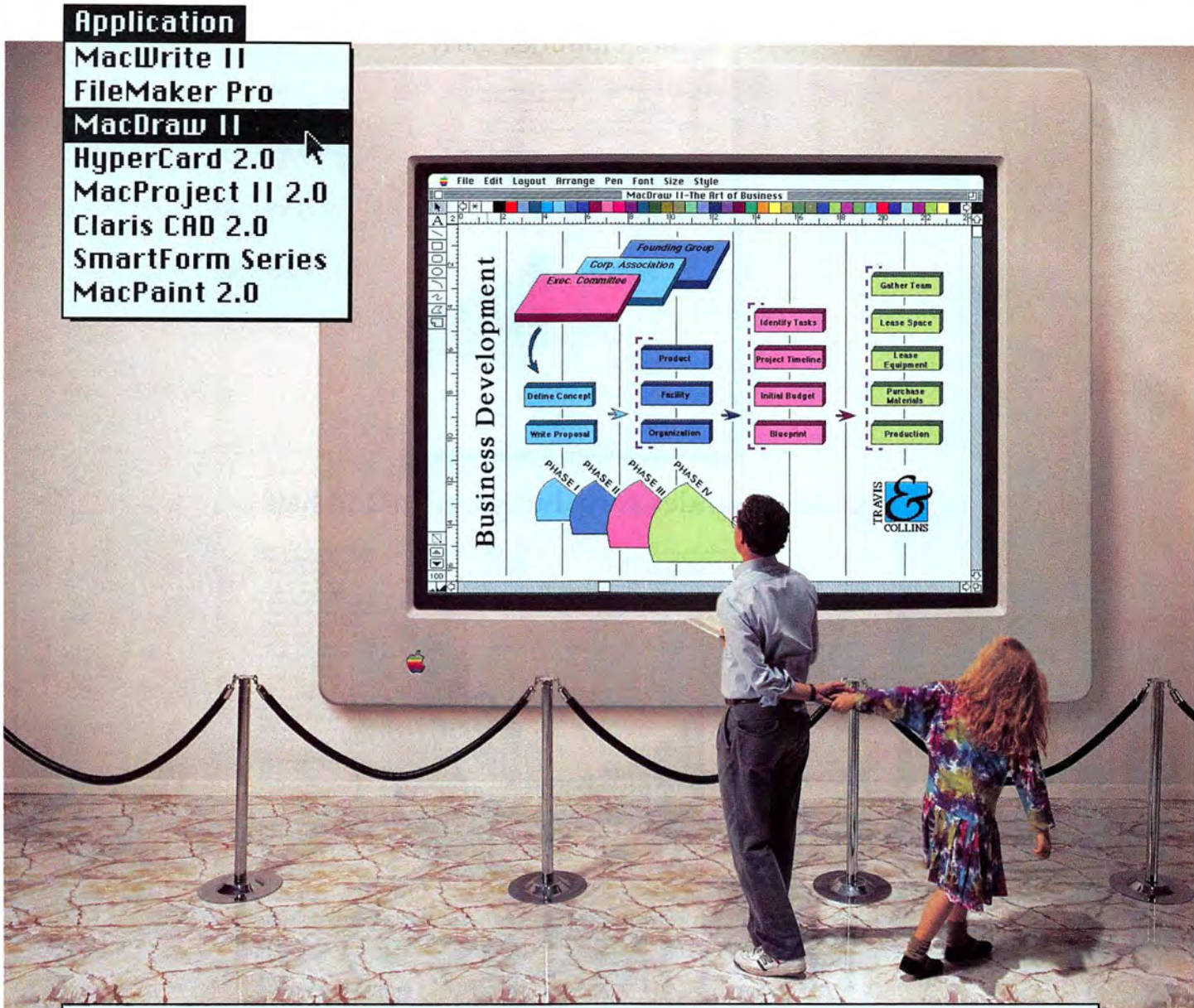
Some graphics programs, such as MacroMind Director, don't provide a command for drawing concentric circles. Here's a quick and simple approach that works with any graphics program that doesn't include a concentric-circle command.

Open the Paint window. Draw a 45-degree line, using the line tool (you can restrain the line tool to 0 degrees, 45 degrees, or 90 degrees by holding down the Shift key). Choose the Sphere tool. Hold down the Shift key, and place the cross hairs on any point on the line. Draw the circle down or up at the same angle as the line.

Now choose another point further along on the same line, and draw out another circle in the same direction and angle as before. You now have perfect concentric circles.

Zeon Slawinski
Washington, DC





Story

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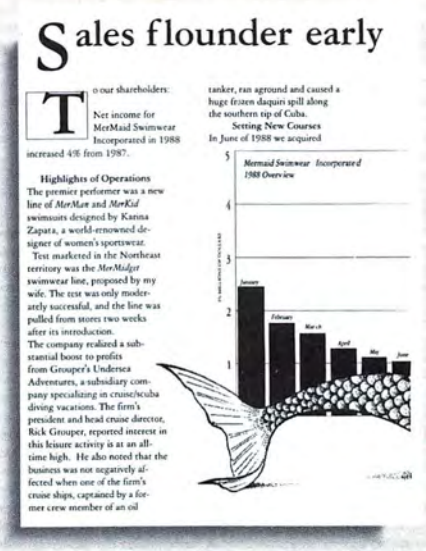
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Sales flounder early

To our shareholders:

Net income for MerMaid Swimwear Incorporated in 1988 increased 4% from 1987.

Highlights of Operations

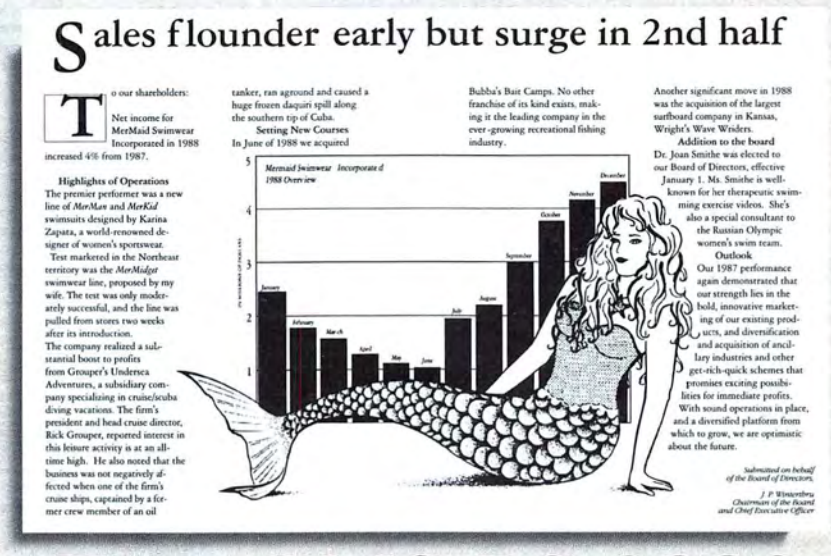
The premier performer was a new line of *MerMan* and *MerKid* swimsuits designed by Karina Zapata, a world-renowned designer of women's sportswear.

Test marketed in the Northeast territory was the *MerMidget* swimwear line, proposed by my wife. The test was only moderately successful, and the line was pulled from stores two weeks after its introduction.

The company realized a substantial boost to profits from Grouper's Undersea Adventures, a subsidiary company specializing in cruise/scuba diving vacations. The firm's president and head cruise director, Rick Grouper, reported interest in this leisure activity is at an all-time high. He also noted that the business was not negatively affected when one of the firm's cruise ships, captained by a former crew member of an oil tanker, ran aground and caused a huge frozen daquiri spill along the southern tip of Cuba.

Setting New Courses

In June of 1988 we acquired



Sales flounder early but surge in 2nd half

To our shareholders:

Net income for MerMaid Swimwear Incorporated in 1988 increased 4% from 1987.

Highlights of Operations

The premier performer was a new line of *MerMan* and *MerKid* swimsuits designed by Karina Zapata, a world-renowned designer of women's sportswear.

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Setting New Courses

In June of 1988 we acquired Bubba's Bait Camps. No other franchise of its kind exists, making it the leading company in the ever-growing recreational fishing industry.

Another significant move in 1988 was the acquisition of the largest surfboard company in Kansas, Wright's Wave Wriders.

Addition to the board

Dr. Joan Smithe was elected to our Board of Directors, effective January 1. Ms. Smithe is well-known for her therapeutic swimming exercise videos. She's also a special consultant to the Russian Olympic women's swim team.

Outlook

Our 1987 performance again demonstrated that our strength lies in the bold, innovative marketing of our existing products, and diversification and acquisition of ancillary industries and other get-rich-quick schemes that promises exciting possibilities for immediate profits. With sound operations in place, and a diversified platform from which to grow, we are optimistic about the future.

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J. P. Winterbru
Chairman of the Board and Chief Executive Officer

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Questions, anyone? Here's where to get answers from the experts. Bob LeVitus is the author of the best-selling Dr. Macintosh. *Andy Ihnatko isn't. But he knows a lot about the Mac, and he's got a heck of an attitude. Together, they're ready to answer your questions about everything Macintosh.*

✉ *Write to Help Folder, c/o* MacUser, *950 Tower Lane, 18th Floor, Foster City, CA 94404.*

Don't want to wait for an answer? Post your question on Zmac, MacUser's *on-line service, and get a reply from Bob, Andy, or one of the other* MacUser *experts. See the masthead in this issue for instructions on how to sign up.*

By Bob LeVitus and Andy Ihnatko

Color Windows on a Mac

Q. I recently read about the Layout program in *MacUser* but didn't discover how to get a copy. How do I go about getting Layout? I'm particularly interested in changing the interior window color to some darker color.

Carl Brown
Seattle, WA

Bob: The December '90 Help Folder (page 315) contained everything you need to know about obtaining shareware and public-domain software. But don't go looking for Layout if you want to change the interior window color. What you really need is Kolor, a free cdev written by Russ Wetmore. Kolor lets you change the default colors associated with buttons, scroll bars, windows, menus, and highlighting (see Figure 1). Kolor isn't available directly from Russ, but it should be easy to find on your favorite on-line service or from a user group.

Andy: Or if you're into spending money, you can buy Preferred Publishers' Personality. In addition to colorizing the desktop, it gives buttons and scroll bars 3-D shading, rainbowizes the pointer, and does tons more cool stuff. Many of Personality's features duplicate shareware INITs that are available on BBSs, but it's still convenient to have them all in one package.

Secondhand Software

Q. Here's a hypothetical (and maybe an ethical) question I'd like your comments on. Let's say I'm a Mac owner and user who's grown tired of being one (remember, I said hypothetical) and would like to sell my hardware and software.

Hardware, I see no problem. Software, though, seems to pose a problem. Although I'm a registered owner of all the software (at least those packages for which the publisher requested registration), the licensing agreement says I can't pass the software on to others.

As I have no use for the software without a Mac (yikes!), do I sell it anyway?

Mark Szczerba
Madison Heights, MI

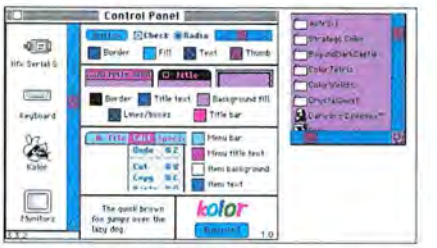


Figure 1: Kolor is a free cdev that lets you customize the color of almost anything on your desktop, and it's available for free from Zmac.

Q. Over the past few years, I have noticed the presence of demonstration/evaluation software for sale in various flea markets in our area. Some of this software comes with registration cards, but most doesn't.

I am seeking your advice about the moral and legal appropriateness of this practice. Is the label "Demo Software/Not for Resale" legally binding? Can I legally buy a fully functional "demonstration" package without fear of prosecution? Can I sell or give it away?

Charles A. Bliley
Rochester, NY

Andy: The short answer is this: If you obtained the software legally (you didn't shoplift it or bootleg it from a friend), it's yours to do with as you wish. Sell it, give it away, bury it in a churchyard under a full moon as a cure for baldness — all hunky-dory in the eyes of the Law. However, I'm looking

*. . . But Were Afraid to Ask

Got a question so simple you're embarrassed to ask it? Don't be shy! Send it on in. We'll even change your name and city to that of a member of Congress to shield your identity if you want. C'mon!

Q. What's the difference between the Finder and the System?

U.S. Sen. John Kerry
(D-Mass.)

Andy: The Finder is probably the Mac's most useful program. In fact, it's so useful that the Mac puts you into the Finder's environment whenever you turn on the machine or quit from another program such as Excel. While in the Finder, you can do maintenance-type stuff, such as copy files from one disk to another, make folders, delete files, and erase disks.

The System file, on the other hand, is not a program. Simply put, it's a collection of information that all your programs need in order to run effectively. For instance, your fonts and DAs, which all programs need access to, are stored in the System file. The System file handles things such as printing, communications, sound If a Mac program needs something, chances are it's in the System file.

The System file itself is so large and has so many little files associated with it that it gets its own folder, the System Folder.

As to how the Finder got its name, well that's probably a good title for a children's book or something. I'm sure the real story is quite dull.

at a mandatory word count here, so I'll give you the long version too.

You have the absolute legal right to sell that software package to someone else if you want to; it's right up there with the Right to Bear Arms. You just have to sell the package as a whole. You can't, for instance, sell someone your manuals and keep the program disks for yourself.

The licensing agreements included with most software packages impose some limits on your ownership, but these limits usually concern making or using additional copies of the program. (Don't bootleg software. Keep in mind that software companies also have the Right to Bear Arms.) Even a statement in the agreement explicitly forbidding you to resell the package might be unenforceable; it violates your property rights — that software package is your property — plus there's been some question as to whether or not unsigned, unwitnessed licensing agreements represent binding contracts at all. (I formed these opinions after talking with a bunch of actual lawyers, although I, personally, am not a lawyer — I play one on TV.)

As a final word of encouragement on the subject, none of the software companies I talked to (and I talked to quite a few, including one whose software licenses forbid reselling) mind if you resell your software. "It's sort of an emotional blow," one rep allowed, "but somehow we manage to struggle on."

So much for the legal question. On to the ethical question, which is, Could you use the cash? So much for the ethical question.

The only thorny issue in buying or selling used software is arranging for product support to ensure that the buyer will be able to get product updates and technical help from the software company. Software companies generally support only registered owners; they ask for your name and product-registration number before they answer any questions. But not to worry. It's usually pretty simple to transfer the registration from seller to buyer. With most software companies, it's as simple as sending a letter with the buyer's name, address, and phone number plus the product's name and registration number. Call the company to determine its official policy.

What about those packages for sale at the flea market? If you don't know who the registered owner is, kiss any hope of product support good-bye. If the serial numbers have been razored off the disks and documentation, run! You don't need to be arrested for receiving stolen goods!

OK, on to the concept of evaluation copies. These are fully functional software packages that a company gives away for free to industry insiders and software dealers in the hopes that they'll persuade noninsiders to buy more copies by the boatload. The one hole in this concept is that it sometimes occurs to the insiders and dealers that a shrink-wrapped copy of PageMaker 4.0 can be converted to a hi-fi VCR quite easily, through an ad in the classifieds.

The "Not for Resale" sticker is intended primarily to prevent dealers from putting their free copies out with their regular stock; it isn't really targeted at users. There are a whole bunch of caveats for buyers and sellers of evaluation copies, though. Industry insiders should keep in mind that most companies keep records of serial numbers. If Stella Q. Average sends in the registration card from some free software sent to Abner L. Bigpundit, well, Abner may soon be in the uncomfortable position of (shudder) actually paying for his own software.

The buyer should know that many companies provide only limited support for evaluation copies. Maybe you'll get a good deal on version 1.0, but when that awesome version 2.0 comes around, you'll have to buy it off the shelf. Once again, if you're concerned about upgrades or support, you should find out what the software company's official policy is before you fork over the money.

Maintaining Links After Backing Up

Q. I have a question about Microsoft Word 4.0. I created a proposal of approximately 1,200 pages, consisting of about 15 separate documents that were linked for printing. This worked fine. After I finished the proposal, I copied it onto a disk for storage and removed it from my hard disk. Several months later, I had occasion to use the proposal again, so I copied it back onto the hard disk. The problem is that when I tried to print it, the links were no longer effective. It kept giving me messages that the next file could not be found, even though they were all together in one folder. Is there any way to maintain these links after moving the files off my hard disk and then back on again?

Alan Johnson
Danville, IL

Bob: This is a common malady of Word (and of plenty of other programs and utilities such as On Location, QuicKeys, OnCue, and probably many more). It happens because the programs keep track of files by something called the directory ID number, a unique number assigned to a file when it's first created. When you delete a file from your hard disk and then copy it back at a later date, it gets assigned a new directory ID. The same thing happens when you restore an entire hard disk from a backup.

Unfortunately, I don't know a workaround for this. It's just one of those things you have to get used to.

Andy: Yeah, it's a bummer all right; your Mac can generate fiscal-income projections right up to the Second Coming, but it can't keep track of a lousy 15 files.

PageMaker Dropouts

Q. Twice recently I've experienced a problem with PageMaker that I can't resolve. When I place an imported EPS graphic, created in FreeHand, on my PageMaker page, the page won't print completely.

There seems to be no logic as to what prints and what doesn't. Each of the files to which I refer contains at least two other graphics, which are scanned images. Sometimes a block of text is left out, sometimes one or two graphics are omitted, and sometimes only the EPS graphic prints on an otherwise pristine page!

Alison Glick
Irvine, CA

Andy: There are four common causes of the "Hey, the graphics didn't print!" problem. Two of them probably won't apply to you, but I'll describe them anyway (if you're in a hurry, skip right ahead to paragraph 4).

You may have placed one of the scanned images and then moved the image file to another disk or folder, where PageMaker couldn't find it. Fortunately, if the program can't find a file it needs, it'll cuss you out with a dialog box, so you'll know what happened. Besides, PageMaker 4.0 automatically incorporates all EPS graphics into the data file itself, so the location of the original EPS file doesn't matter.

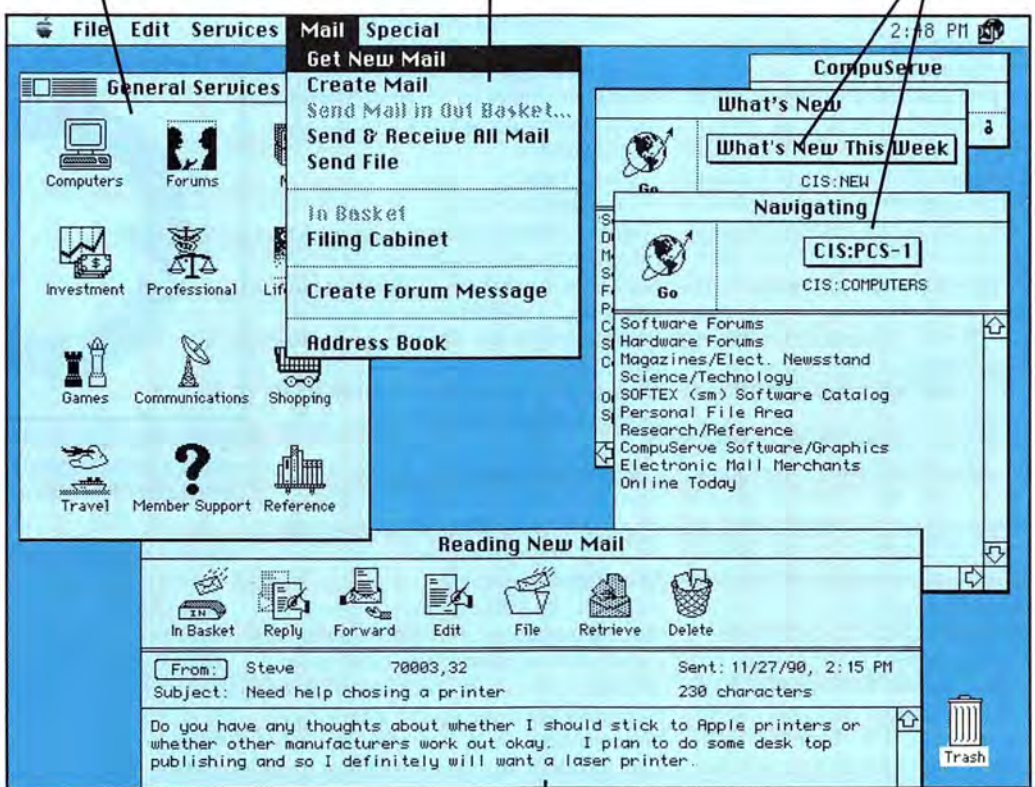
Second possibility (from the Simple Explanations department) is that you may have checked the Proof Print option in the Print Setup dialog box. This is a time-saving measure in which PageMaker prints dummy-style boxes in the place of any placed graphics. If you don't see a

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Requirements for Mac version of CompuServe: Mac Plus or later model Macintosh with at least one megabyte of RAM. Mac System 6 or later version: hard disk, one 800K (or higher) floppy drive. Hayes compatible modem recommended.
*Suggested retail price.

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box containing a jumbo X where you placed your graphics, you can rule this one out.

Howdy, Alison, welcome back. If the dropouts are irregular (page elements of all types either print or won't print, without reason or mercy), you're probably looking at a bona fide computer screwup. If you've installed a screen saver, try turning it off. Some screen savers can cause trouble if they kick in while a document's being printed; the computer becomes engrossed in the challenge of drawing those fireworks, or fish, or exploding penguins, or whatever and quite literally "forgets" to send some data to the printer.

It's also possible that the page was just too darn complex and your printer ran out of memory. I think that's unlikely in your case. Usually when that happens, your Mac is polite enough to report a "Not enough memory, bonehead!"-type error message. If you suspect this kind of trouble, you can clear any and all errors from your printer by switching it off and back on again.

Bob: If your FreeHand file contains downloadable fonts, there's one more thing you might try. If you've already turned your printer off and then back on again and you still can't get the page to print, turn the printer off and then on one more time. Then manually download all the fonts used on the troublesome page—all the fonts you used in PageMaker and all the fonts in your EPS graphic. Now print the troublesome page (but not the entire document). I've used this technique successfully several times when nothing else would work.

P.S. To download stuff to your printer, you need a program such as Font Downloader, which is included with Adobe fonts, or CE Software's Widgets or LaserStatus.

Downloading Geneva?

Q. I am the primary user of one of four Macintosh SEs connected to an Apple LaserWriter at the Orange County High School of the Arts. Unfortunately, I'm not the only user. Several of our artistic but not necessarily computer-wise staff members attempt to enter their own information after school.

One weekend, our orchestra conductor used my machine to create a mailing-list database. I know this because he kept calling me at home with questions. When I attempted to print a document on Monday morning, I received the message that

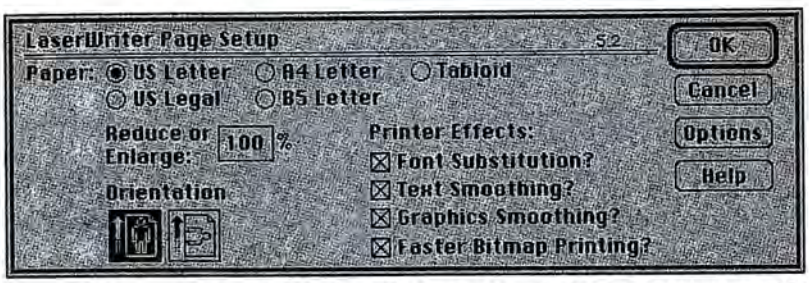


Figure 2: Make sure the Font Substitution option is turned on for best results when you print bit-mapped fonts to a laser printer.

a font needed to be created for Geneva because no printer font existed. The font that prints now doesn't look anything like the old Geneva.

Nancy Egan
Los Alamitos, CA

Bob: It sounds as though your orchestra conductor pushed a button, but I don't think it's necessarily "unknown and damaging." I suspect he unchecked Font Substitution in the Page Setup dialog box. Just select Page Setup from the File menu of your application, and then click on the Font Substitution box (see Figure 2).

By the way, the font you refer to as your old Geneva is actually Helvetica, which is what the LaserWriter automatically substitutes for Geneva when Font Substitution is enabled.

Andy: The substitutions are based on the original cheesy bit-mapped fonts that came with the Mac. With substitution enabled, New York becomes Times, Geneva becomes Helvetica, and Monaco becomes Courier. In fact, with substitution enabled, any other font that the LaserWriter isn't familiar with is turned into Courier at print time, causing no end of consternation.

Incidentally, you should probably install the Helvetica bit-mapped fonts on your Mac (if they aren't there already) and avoid the middleman. When the Mac substitutes Helvetica for Geneva, it changes word- and letterspacing so that the Helvetica type more closely matches the spacing of the Geneva you saw on-screen, which can lead to some rather weird-looking type.

Recycled Clip Art

Q. As I find myself using recycled paper more and more, I've been trying to locate clip art of the recycling symbol. I have been able to find it only as hard copy, and I'm getting sick of cutting it out and gluing it onto everything I create.

Another thing, will you be accepting

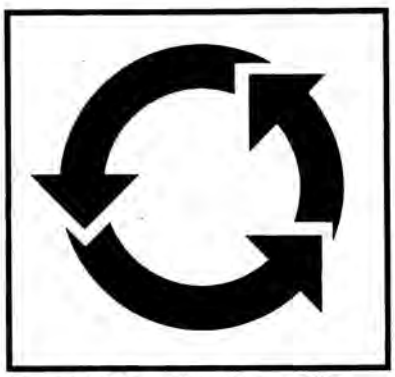


Figure 3: Bob's version of the recycling symbol, created in Illustrator 1.9.5. You can download it from Zmac.

Help Folder questions through your new Zmac on-line service?

Steve Jones
Jefferson City, MO

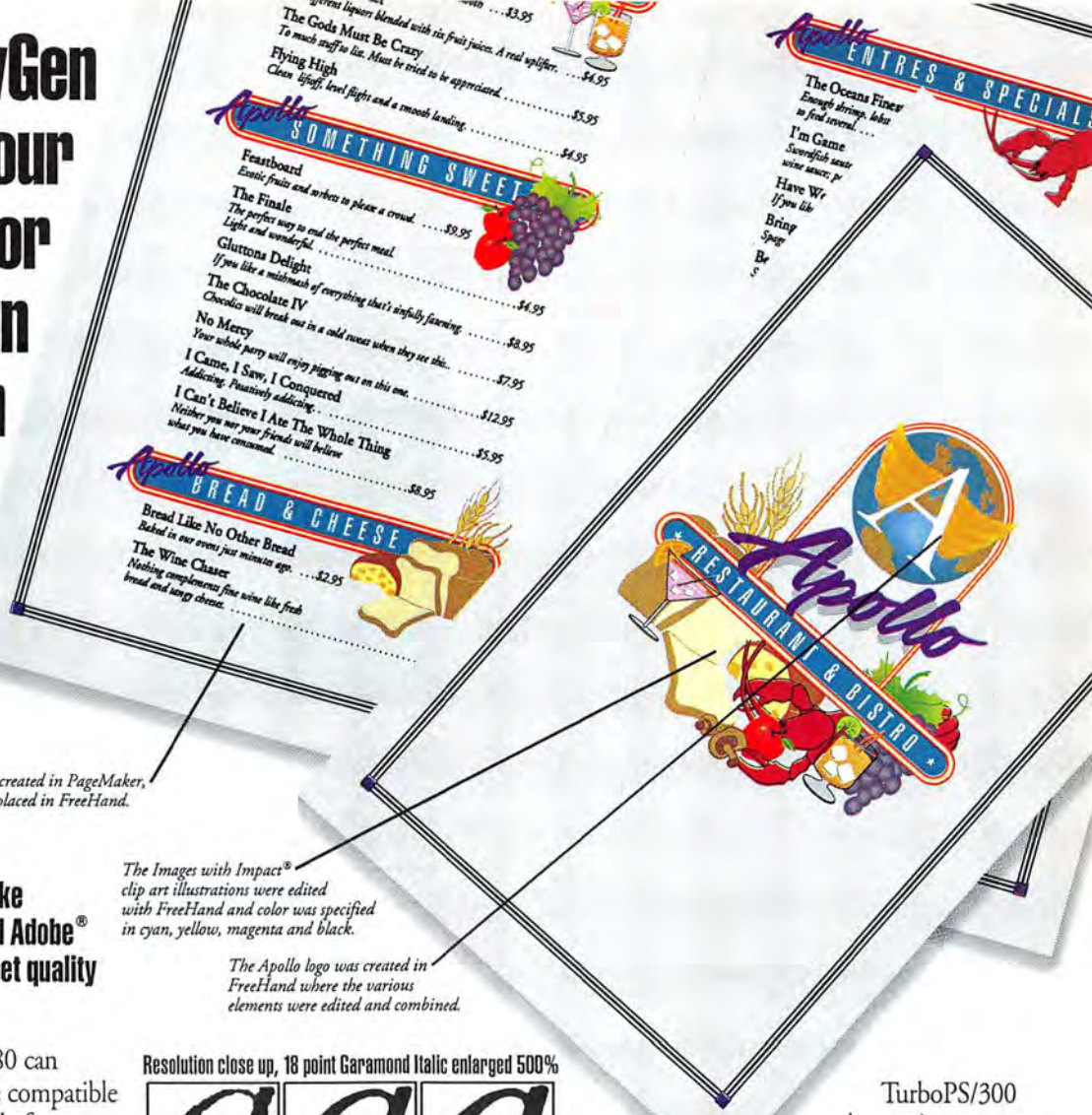
Bob: I've got lots of good news and a little bad. First, I found a recycling symbol (in EPS format) in the Click and Clip 500 clip-art package (Studio Advertising Art, 4305 E. Sahara Avenue, #1, Las Vegas, NV 89014; [702] 641-7041). The bad news is that the recycling symbol is part of a 15-disk set that retails for $395.

I got this information from what I consider to be the ultimate resource for locating clip art, *Canned Art—Clip Art for the Macintosh,* by Erfert Fenton and Christine Morrissett (Peachpit Press, 1085 Keith Avenue, Berkeley, CA 94708; [800] 283-9444). It's a meticulously indexed and organized book with representations of artwork from dozens of clip-art manufacturers. It's huge and worth every penny of its $29.95 cover price.

The other good news: After seeing the recycling symbol in Canned Art, I created my own EPS version, using Illustrator 1.9.5 (see Figure 3). Because you asked about Zmac, I assume you have a modem and can log on there. I'll upload a copy—enjoy.

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Text for the menu was created in PageMaker, saved as EPS files and placed in FreeHand.

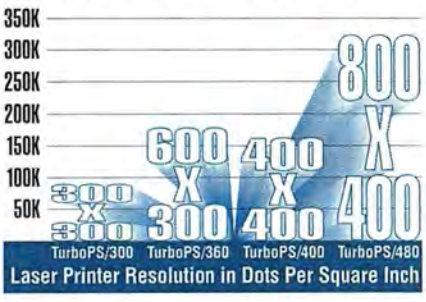
The Images with Impact® clip art illustrations were edited with FreeHand and color was specified in cyan, yellow, magenta and black.

The Apollo logo was created in FreeHand where the various elements were edited and combined.

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questions for Help Folder in Zmac. Send 'em to our attention in the Editors On Line area. My address is 76004,2076; Andy's is 72511,204.

Andy: BBSs and public-domain libraries are full of pictographs and the like, drawn by thoughtful, caring Mac users such as Bob and available for pennies. If you can't find the symbol you need, though, just hop on down to your local art-supply store. It'll have books of public-domain symbols (artwork you can reproduce with impunity) for just a few dollars apiece. Take the book down to your local DTP service bureau, and the staff'll scan the pictograph into a TIFF file for about ten bucks or so.

Illustrator Blends

Q. Last month we bought Adobe Illustrator for our school's art department. Our students have found the application very rewarding.

To date, however, we've been unable to create a smooth graduated fill with the blend tool. When a four-inch graduated fill (20-percent black to 5-percent black) is typeset on a Linotronic L300 at 2,540 dpi, the fill appears with a banding effect, even with 100 steps! Have we made the wrong choice of application for the task, or are we somehow not using the application properly?

I have enclosed a dollar bill to cover the cost of mailing a reply.

Pravin Mehta
Etobicoke, Ontario
Canada

Andy: By now our editor has mailed your dollar back to you, Pravin. We're not allowed to accept cash or merchandise, so remember: Things such as money, hi-fi VCRs, and canned goods must be sent *directly to our home addresses*.

Now then. Illustrator is a perfectly spiffy program — it's just that there are some tricks to getting nice, smooth graduated fills. I'm sure you've glommed on to the idea of specifying more blending steps so the difference in shading between one step and the other becomes more difficult to notice, but there are a couple of drawbacks to this ploy. It makes for a humongous file that takes insanely long to print; it may also cause your printer to despondently leap through the nearest plate-glass window to a messy death on the street below.

Well, probably not, but that huge file could cause your printer to freeze up for lack of memory. Also, PostScript imposes a limit of 256 steps on a fill, so at some point in a certain job, it may become clear that simply goosing the number of steps may not be the best solution.

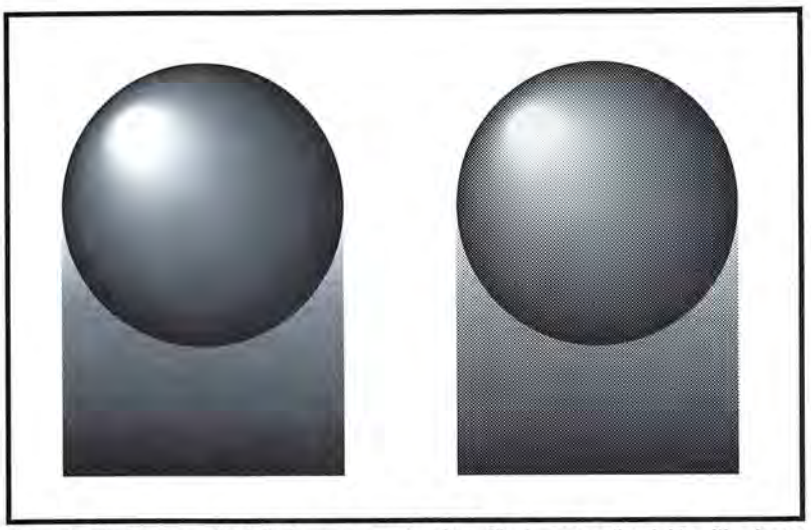


Figure 4: The image on the left shows savage banding. The image on the right, with a lower screen frequency, has smoother blends but is a lot fuzzier — see the bottom curve of the circle, for example.

1 $\left[\frac{\text{dpi}}{\text{lpi}}\right]^2 \times \text{\% change in color} = \text{number of steps}$

2 $\left[\frac{2{,}540 \text{ dpi}}{120 \text{ lpi}}\right]^2 \times \text{15\% change (0.15)} = 67 \text{ steps}$

3 $\text{highest lpi for a smooth fill} = \text{dpi} \times \sqrt{\frac{(\text{change in color}) \times 0.03}{\text{Length of blend (inches)}}}$

A more fruitful avenue may lie in tweaking the screen frequency (lines per inch) that the printer uses in printing the image. Lines per inch has a direct effect on the appearance of graduated fills. The higher the screen frequency, the fewer shades of gray the printer can generate. Therefore, a high lpi can lead to savage banding no matter how many steps you've used in the fill! Lowering the screen frequency generally yields smoother-looking blends, but it can give the image a coarse appearance (see Figure 4).

You can manipulate the screen frequency with Adobe Separator, or simpler still, if you're using a service bureau, you can just tell the guy at the desk what frequency you want the printer to use.

I've come across at least half a dozen different schemes, tricks, and formulas for minimizing banding. In the Pursuit of Truth, I tested 'em all, and here's the one (one!) that (a) I understand and (b) seems to work in most situations.

These formulas help predict whether or not a certain blend will show banding, given the dpi and lpi of the printing device and the length and severity of the fill.

First, figure out how many blending steps you'll need by using the formula in Example 1, above. In your case (a 20-percent-to-5-percent blend printed on a 2,540-dpi printer at the default setting, 120 lpi), the formula works out as shown in Example 2.

This result is the largest number of steps necessary for a smooth fill. One hundred steps wouldn't improve the appearance of the blend, nor would 256. If the maximum number of steps works out to be greater than 256, trim it down to 256; remember, 256 blending steps is a limit imposed by PostScript.

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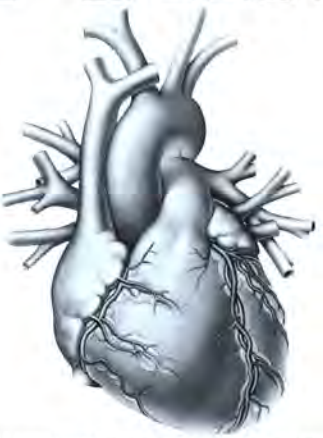
PhoenixPage

Next, you divide the length of the blend (in inches) by the number of steps you got from the above formula. The result is the blend factor. As a rule of thumb, a blend factor greater than .03 means that banding will be apparent in the fill. In your example, you divide 4 by 67 and get .06. Aha!

Something has to be done to get a smooth fill. If you look at the equation, you'll notice that cutting the length of the fill in half, to 2 inches, will yield a blend factor of .03 and thus a smooth fill. If you'd rather reduce the screen frequency, use the formula in Example 3; you'll find that any screen frequency lower than 85 lpi will do the trick.

My final comment on this scheme is that it's just a rule of thumb; there's no guarantee that the blend will be smooth as silk. Although the formulas cut a few logical corners, they appear to be useful yardsticks for how smooth your blend appears. Remember, the lower the blend factor, the better.

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Paper-Folding Machine

Q. In the old days, when you [Bob] were editor of *MACazine*, you frequently talked about a product you said did its job very well. It was a machine that folded letter-sized pages in three, and I believe it cost about $300.

I have searched through many back issues of *MACazine* and have been unable to find this product anywhere. Do you remember the product, and can you give me the company's name and address?

Peter Christ
Sedro Woolley, WA

Bob: I remember the product well. *MACazine*'s senior editor, C. J. Weigand, was the one who frequently raved about it. I couldn't find it in my back issues either, but I called C. J., and he came through for you. The product is called Auto Folder, and it's made by AutoFold (6940 Argon Circle, #4, Buena Park, CA 90620; [800] 443-9501 or [714] 670-0571). Its suggested retail price is $279.

Andy: You've sold me, Bob . . . I'll take a pair in my size.

Killer Post-it Notes

Q. A couple of months ago, I put a disk with a Post-it note attached into the internal drive. All was well until disk ejection failed; the disk protruded only a quarter inch or so from the drive (that was when I noticed the note). After some careful probing with a thin steel scale, I was able to remove the disk and note intact.

Subsequent use of the internal drive was troublesome during ejection, however: Some disks popped out normally, some came out only partway, and some started out and then went back in again. Gradually the problem disappeared. Then a couple weeks ago, the drive suddenly refused to recognize disks.

I removed and examined the drive mechanism but could find no anomalies. I swapped the mechanisms of my internal and external drives. Imagine my chagrin

when I found that the external (formerly internal) drive worked perfectly! I opened the Mac again and checked for bent pins in the drive connectors or a break in the ribbon cable, but all was shipshape.

I've exhausted all the causal possibilities I can think of. Got any ideas?

Robert H. Peterson
Hemet, CA

Andy: Well, Bob, I wish you had read your manual. Right there on page 133, after the paragraph that says "Don't put Post-it notes on your disks," it says, "And for God's sake, if one gets stuck in the drive, *don't* try to get it out by jabbing a thin steel scale in there!!!"

Seriously, if a disk gets stuck in the drive and you can't coax it out by sticking an unbent paper clip into the manual-eject hole, your safest bet is to open the Mac and remove the disk from the mechanism by hand.

Oh, and of course don't even consider this unless you're a Qualified and Licensed Apple Service Technician or at least watch "MacGyver" regularly.

My guess is that when you probed with the thin steel scale (my dictionary tells me that's another word for *ruler*), you may have put the drive's mounting bracket out of alignment. If the drive mechanism is angled slightly up or down, a disk gets a slight bend imposed on it when you slide it in, the drive heads can't maintain optimum contact with the surface of the disk, and you get errors. This would account for the fact that your external mechanism went south when installed as the internal drive. The *mechanism* was fine, but the bracket was holding it at an angle. Another nasty effect of all this is that the disk is slowed down or blocked completely by the front bezel when the mechanism tries to spit the disk out.

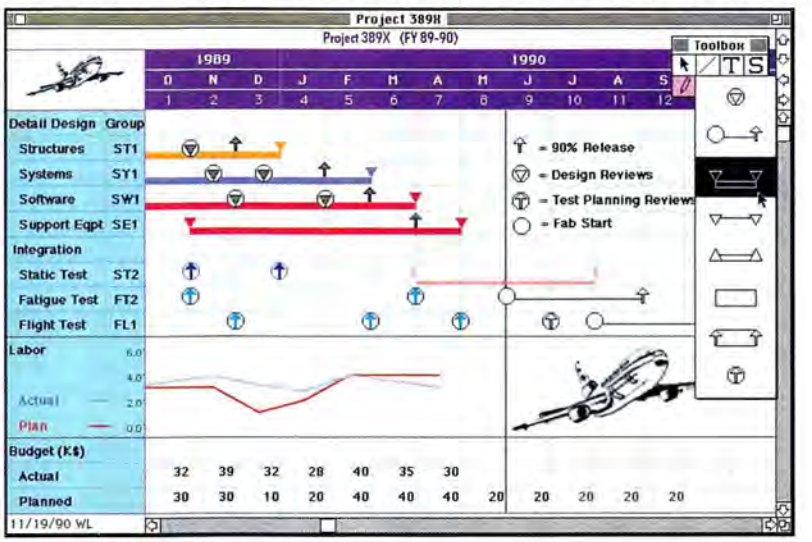
Try removing the mechanism and reinstalling it. When you do, keep a floppy halfway inserted through the bezel and the mechanism. That'll help make sure that the mechanism is mounted at the proper angle. If it *still* doesn't work, take it to your Friendly Local Apple Dealer. Repeat after me: "I dunno . . . it just *stopped working* all of a sudden"

Bob: I recommend the extremely conservative approach — if you ever get a floppy disk stuck in a drive, *do not try to remove it yourself.* It's far too easy to damage the drive when you poke around. If the paper-clip-in-the-little-hole trick doesn't solve the problem, take your Macintosh to an authorized Apple dealer and have the dealer perform this delicate surgery. Although it will cost you a few bucks, it's certain to be less than the replacement cost of the drive. Most Apple dealers won't repair a broken floppy drive; they'll insist on replacing it, at a cost of several hundred dollars.

Esc for Old Keyboards

Q. I use my Macintosh Plus and a modem to access my office computer and work on the UNIX system there. My problem is that when I use the vi editor, I need to use the Escape key to change from

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the text-input mode to the command mode. Is there any way to generate the Escape character with my Plus?

I use Smartcom II. Do I need new software? If so, what? I'm kind of desperate, because I could be doing more at home and not have to go into the office so often. I've read *Inside Mac* and some other documentation, to no avail. Short of sitting down and writing my own software, I'm at my wits' end.

Dan Kell
Sunnyvale, CA

Bob: There are a couple of things you might try. If you want to go whole hog, you can use MicroPhone II to remap the Escape key so you can send it from earlier Mac keyboards. Although MicroPhone II is a great terminal program, it's relatively expensive if all you need is a way to send that pesky Escape character.

An easier solution is to use QuicKeys II. It's less expensive than MicroPhone II, and you'll find it useful in almost every application. If you don't already have a copy, get one — you'll love it. You'll have to create the key set with the alias for the Escape key on a Mac with a newer keyboard and then save the key set and install it on your Plus.

Or, CE Software has created a QuickKeys key set called Control.KEYS that contains aliases for keys not available on the Plus keyboard — the Escape key (along with Shift-Esc, Command-Esc, and so on) and Control-A through Control-Z. You'll find a copy in the Zmac library.

Andy: Or you can just send the ASCII code in Smartcom II, without any add-ons. To generate an Esc code, press Control-[. As you lack a Control key too, you'd need to press Command-[.

While we're recommending alternative software here, I'll cast my vote for VersaTerm and VersaTerm-PRO, which are absolutely the most convenient and bulletproof terminal emulations I have ever used. And you're talking to a fellow Plus jockey, with a similarly crippled keyboard.

You may also want to look into buying a third-party extended keyboard, such as Datadesk's Mac-101. It's an IBM PC/AT-style keyboard complete with Control, Escape, function, and a slew of other keys, thus bypassing the need for clumsy key alternatives in most situations.

Last — assuming you're dealing with a big-time computer system here — talk to the computer's system administrator. Many of the larger systems have dozens of terminal-setup files. A university computer of my acquaintance (I think it was an ADM/3A or something) would have nothing to do with my Mac until I started telling it (at log-on) that I had a measly, pitiful terminal with absolutely no function keys at all. From that moment on, it took pity upon me and allowed me to use a whole library of alternative keys. Sure, you'll have to talk to an actual human being to get this info, but it might be worth it.



Figure 5: This is a Dark Castle rat. Don't expect it to obey the same laws of nature as, say, *rattus norvegicus*.

Castle Rats Defy Physics

Q. Some things just defy logic. In Dark Castle, I was playing TROUBLE 1 and going down a set of staircases when a rat bit me. So then I rolled down the stairs and died. (The guy on the screen, not me.)

How can a rat bite me while I'm going downstairs and it's on the other level? Think about it — when walking down stairs, you're usually in the middle, and I seriously doubt that there is a handrail on those stairs.

Steve Brooks
Houston, TX

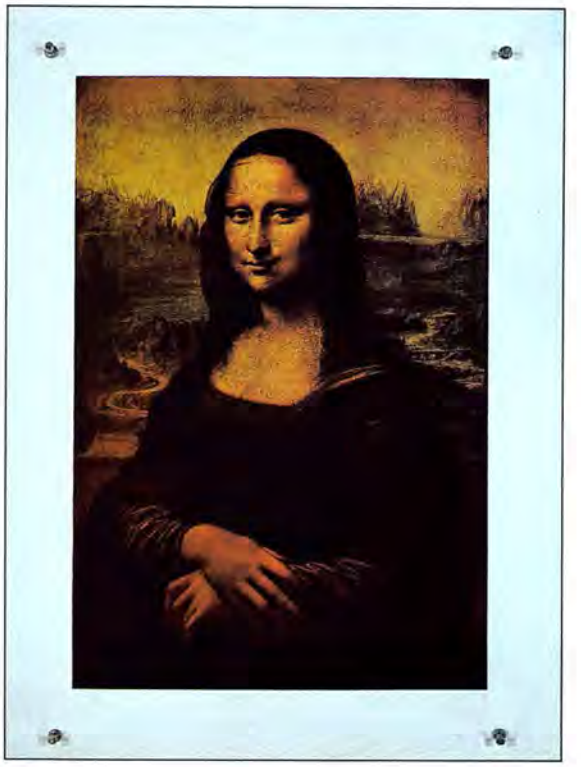
Andy: Well, look at the screen. The rat *is* technically touching your head, isn't he? No one said life in a two-dimensional plane was fair.

I mean, when an Acme Exploding Jet-Boomerang reduces Wile E. Coyote to ashes, you don't wonder how he manages to turn up, alive and plummeting off a cliff, eight seconds later, do you? We must accept that the field of Cartoon Physics is largely unplumbed by our nation's scientists, who instead waste their time horsing around with supercolliders and stuff.

Bob: I wouldn't know — Dark Castle is too tough for me. I guess, being an older fellow, I lack the proper eye-hand-mouse coordination for arcade-style games. I'm bad at all the "-tris" games too. (You know, ones such as Welltris, Tetris, and Buttris.) When I need my fix, I stick to easy games with a firm basis in reality — like Leisure Suit Larry in the Land of the Lounge Lizards.

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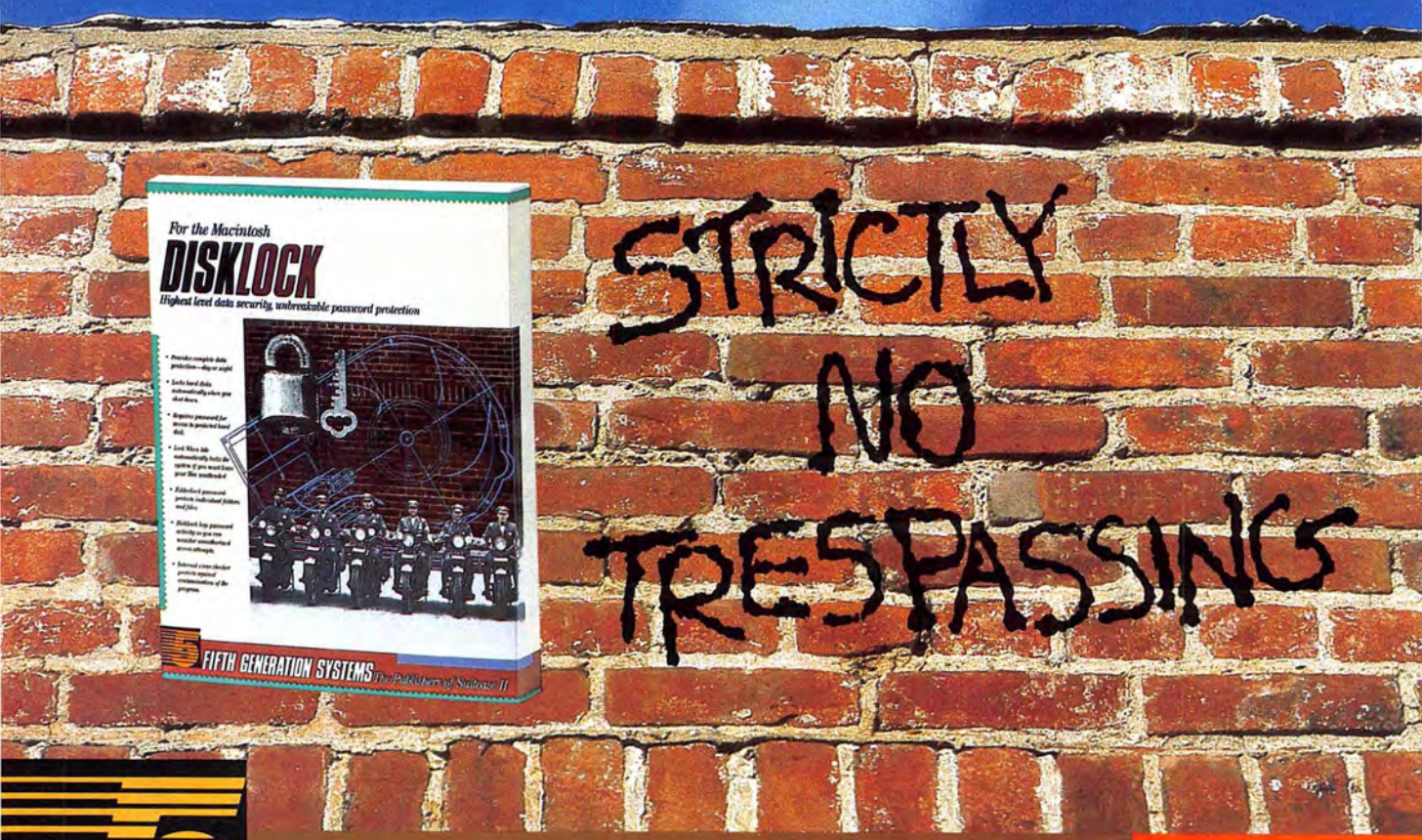
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Desktop Publishing

• Fonts and Typography

Adobe Type Manager ♦♦♦♦
Adobe Type Manager makes your fonts better almost magically. It creates smooth screen-font images of any size and improves output from most QuickDraw printers. Not quite perfect (there are some problems with Word and smaller point sizes) and slow on 68000 Macs, but improvement in quality is usually worth the effort. Version 2.0. Requires Mac Plus or later. $99 (includes Times, Helvetica, Courier, and Symbol fonts — other fonts additional); upgrade, $20 plus $7.50 postage and handling. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (Feb '90) ★'89 Eddy

The Art Importer ♦♦♦♦½
The Art Importer creates PostScript fonts containing up to 256 graphic characters. Accepts logos, clip art, and PICT and EPS graphics. As fonts, graphics can be used in programs that don't normally accept them, and resizing is as easy as changing point size. Supports any color art. Math-coprocessor version available. Version 2.0. Requires Mac Plus or later with 1 megabyte of RAM and System 4.2 or later. $149. Altsys Corp., 269 W. Renner Rd., Richardson, TX 75080. (214) 680-2060. (Apr '90)

Expressionist ♦♦♦♦♦
Expressionist is a powerful DA that lets you create complex mathematical equations within applications. Equation manipulation has never been easier. Version 2.07. Requires Macintosh 512Ke or later. $129.95. Prescience Corp., 939 Howard St., San Francisco, CA 94103. (415) 543-2252. (July '87)

FONTastic Plus ♦♦♦♦½
FONTastic Plus lets you customize and create bit-mapped fonts. It's easy to add or modify characters. Version 2.01 edits larger fonts and supports NFNTs. Version 2.02. Requires Mac 512K. $99.95. Altsys Corp., 269 W. Renner Rd., Richardson, TX 75080. (214) 680-2060. (May '89)

Fontina ♦♦♦♦½
Fontina offers an excellent way to manage fonts by showing all your fonts simultaneously — in multiple columns if necessary. No scrolling is generally required. Fontina can show fonts in a selected typeface and point size; however, the ability to display the actual typeface (the other basic font-managing technique) is not an option. The Fontina INIT is trouble-free and performs excellently. Version 1.0 — Albuquerque 9. $69.95. Eastgate Systems, P.O. Box 1307, Cambridge, MA 02238. (617) 924-9044. (Sept '90)

FontLiner ♦♦♦♦
FontLiner converts Fontographer-created typefaces into PostScript outline fonts that can be edited in Illustrator and FreeHand. Version 1.0. Requires Mac with 1 megabyte. $129.95. Taylored Graphics, P.O. Box 1900, Freedom, CA 95019. (408) 761-2481. (July '89)

Fontographer ♦♦♦♦
Fontographer is an upgrade of the top PostScript-font editor/generator. New features include an integrated screen-font editor, auto-tracing, and a pen tool. This is a professional tool that also includes PostScript "hints" within your fonts. Screen-font editor automatically generates bit-mapped fonts but is strictly bare bones. Can also be used for creating logos but needs better drawing tools for this purpose. Version 3.1. Requires Mac Plus or later with 1 megabyte of RAM and System 4.2 or later. $495. Altsys Corp., 269 W. Renner Rd., Richardson, TX 75080. (214) 680-2060. (Jan '90)

FontSizer II ♦♦♦♦½
FontSizer II creates high-quality screen fonts of any downloadable PostScript typeface in sizes up to 96 points. Excellent utility for producing large font sizes with true WYSIWYG. Version 2.0. Requires Mac Plus or later, System 5.1 or later, PostScript printer, and PostScript fonts (which can be in printer). $99.95. U.S. MicroLabs, Inc., 1611 Headway Cir., Building 3, Austin, TX 78754. (512) 339-0001. (Apr '89)

FontStudio ♦♦♦♦½
FontStudio is the only fully integrated font-creation tool available. Its ability to store character parts in a library, excellent bit-map editor, and strong kerning-pairs interface may make this package attractive to type designers. FontStudio's biggest failing is its lack of automated hinting. Cheaper than the Altsys family. Version 1.0. Requires 1 megabyte of RAM and a 20-megabyte hard-disk drive. $595. Letraset, 40 Eisenhower Dr., Paramus, NJ 07653. (800) 343-8973 or (201) 845-6100. (Sept '90)

Formulator ♦♦♦♦½
Formulator is a powerful and easy-to-use formula-setting application. Can output in TeX as well as "regular" format. Version 1.1. Requires Mac 512K or later and runs only with U.S. System software. (International version available from Icon Technologies, Leicester, England.) $99.95. ICOM Simulations, Inc., 648 S. Wheeling Rd., Wheeling, IL 60090. (708) 520-4440. (Oct '89)

Hermes & Tribune Fonts ♦♦♦♦½
Hermes & Tribune Fonts are specially designed fonts that come in sizes up to 120 points. Optimized for the ImageWriter LQ, the LaserWriter IISC, and fax modems. These fonts look better than Apple's fonts and can replace Helvetica and Times. $49.95. Miles & Miles, 704 N. Water, #1, Ellensburg, WA 98926. (509) 925-5280. (Sept '89)

KernEdit ♦♦♦♦
KernEdit is a basic kerning program with a rather un-Mac-like interface. Word View is a nice feature that greatly simplifies kerning-table creation. The maximum resolution possible is 1/1000 em. There are 17 kerning-table packages, each containing 25 tables. Version 1.06. Requires Mac Plus or later. $149; additional kerning tables, $95 per package. Pairs Software, 160 Vanderhoof Ave., Suite 201, Toronto, Ontario M4G 4B8, Canada. (416) 467-8784. (Apr '90)

KeyCap Fonts ♦♦♦♦
KeyCap Fonts contains three typefaces that are designed specifically for writing computer documentation. Version 1.0. $149.95. Paperback Software International, 2830 Ninth St., Berkeley, CA 94710. (415) 644-2116. (June '89)

LetraStudio ♦♦♦♦
LetraStudio is a type-customization program for creating headlines, logos, signs, and other display type. Predefined envelopes let you create unique distortion effects. Version 1.5. Requires Mac Plus or later with 1 megabyte of RAM and a hard-disk drive. $495; $75 per font. Letraset, 40 Eisenhower Dr., Paramus, NJ 07653. (800) 343-8973 or (201) 845-6100. (May '89) ★'88 Eddy

LetrTuck ♦♦♦½
LetrTuck lets you add, delete, or modify the kerning pairs for any installed font. Version 2.2. $99. EDCO Services, 12410 N. Dale Mabry Highway, Tampa, FL 33618. (800) 523-8973 or (813) 962-7800. (June '89)

Letterforms and Illusions ♦♦♦♦
Letterforms and Illusions is a set of fonts and figures designed by Scott Kim that leads you into exciting typographic explorations. Includes a limited

Mice Ratings ♦ ♦½ ♦♦ ♦♦½ ♦♦♦ ♦♦♦½ ♦♦♦♦ ♦♦♦♦½ ♦♦♦♦♦

version of MacPaint. Requires Mac Plus or later. $39.95. W.H. Freeman & Co., 41 Madison Ave., New York, NY 10010. (212) 576-9400. (Mar '90)

MacTeX ‡‡‡½

MacTeX is the TeX environment of choice for hard-core Mac TeX users — very intimidating for others. Painfully slow and visually unattractive. Version 2.0. Requires Mac Plus or later. $750. FTL Systems, 234 Eglington Ave. E., Toronto, Ontario M4P 1K5, Canada. (416) 487-2142. (Apr '88)

Metamorphosis ‡‡‡‡

Metamorphosis is a simple program that gives type designers and artists access to Adobe Type 1 font outlines. It basically has one function: to convert characters from any Type 1 or Type 3 font into editable PostScript outlines. Version 1.5. Requires Mac Plus or later with 1 megabyte of RAM and System 6.0.4 or later. $149. Altsys Corp., 269 W. Renner Rd., Richardson, TX 75080. (214) 680-2060. (Sept '90)

PostScript Type Sampler and Type Listing ‡‡‡‡

The PostScript Type Sampler and Type Listing is a classic art-director's type book with samples of all the available laser fonts. The material is also available and searchable on-disk, but screen-resolution considerations make the printed version the more valuable part of this package. Type Listing requires Microsoft Works (the text file is also provided). Type Sampler is in notebook form. Type Listing, $200 (includes three to four updates); Type Sampler, $75; one year of printed updates, $80; Sampler, one year's update service, and Listings, $255. MacTography, 326-D N. Stonestreet Ave., Rockville, MD 20850. (301) 424-3942. (Apr '90)

Publishing Packs ‡‡‡½

Publishing Packs bundles three Adobe typefaces that work well together for particular publishing projects. The packages offer substantial savings over purchasing the typefaces individually, and the documentation has useful information on typeface characteristics. Requires Mac Plus or later. Newsletters, $395; Forms and Schedules, $475; Presentations, $475. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (Feb '89)

Textures ‡‡‡

Textures is an implementation of TeX, the big daddy of typesetting programs. Good for users trained on mainframes in the early days. Otherwise very sticky, with a high learning curve. Version 1.3. Requires Mac Plus or later with 2 megabytes of RAM. $495; education, $395. Blue Sky Research, 534 S.W. Third Ave., Portland, OR 97204. (800) 622-8398. (Apr '88)

TScript ‡‡‡½

TScript makes a variety of QuickDraw-based and other non-PostScript printers PostScript-compatible. No frills. Can preview a PostScript file on-screen. Characters may suffer from the jaggies if you try to rotate, apply fills, condense, or expand text strings in some fonts. Relatively quick. A low-cost alternative if you're willing to live with some limitations. Version 1.2 reviewed; version 1.3 shipping. Requires Mac Plus or later and a hard-disk drive. $145. Tele-Typesetting Co., 474 Commonwealth Ave., Boston, MA 02215. (617) 734-9700. (Aug '90)

TypeAlign ‡‡‡‡½

TypeAlign is an INIT/DA combination utility that is essential for DTP work if you use ATM. It lets you place text along circular, angled, or arbitrary paths. The program could use the Clipboard better, but a big drawback is its limited effects. Version 1.0.4. Requires Mac Plus or later with 1 megabyte of RAM, System 6.0.2 or later, Adobe Type Manager, and two floppy-disk drives; hard-disk drive recommended. $99. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (May '90)★'89 Eddy

TypeStyler ‡‡‡‡

TypeStyler is a utility application that lets you distort regular type to create display type. It supports 8-bit color and can output files as process-color separations. Its performance is excellent except on low-end Macs, where it might be unacceptably slow. Includes 10 fonts. Version 1.5. Requires Mac Plus or later. $199.95. Brøderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903. (800) 521-6263 or (415) 492-3200. (May '90)

UltraSpec ‡‡½

UltraSpec performs copy-fitting chores such as calculating copy length, creating dummy pages, and producing printer specs. Version 1.0. Requires Mac Plus or later and HyperCard. $149.95. SoftStream International, Inc., 19 White Chapel Dr., Mount Laurel, NJ 08054. (800) 262-6610 or (609) 866-1187. (June '89)

World Class LaserType ‡‡‡‡

World Class LaserType is a six-volume collection of PostScript fonts that are a good alternative to more-expensive fonts. Each volume comes on two 800K disks and includes screen fonts and PostScript-printer fonts. An excellent value. Requires PostScript printer. $79.95 per volume. Dubl-Click Software, Inc., 9316 Deering Ave., Chatsworth, CA 91311. (818) 700-9525. (Dec '89)

• PAGE LAYOUT

CopyFlow ‡‡‡‡

CopyFlow is a QuarkXPress XTension that allows batch-importing or -exporting. It adds its own menu to QuarkXPress. You begin by naming all the text and graphics elements that you want to import, and then CopyFlow automates placement. Works well and can be a time-saver. $395. North Atlantic Publishing Systems, P.O. Box 682, Carlisle, MA 01741. (508) 369-1931. (Sept '90)

Design Studio ‡‡‡½

Design Studio is based on Ready,Set,Go! but is more than just a beefed-up version of that program. It has new layout-management features, and its handling of text, graphics, and color is welcome. It shows many of RSG's drawbacks, however. Performance needs to be improved considerably, and a totally new manual would be very helpful. Version 1.0. Requires Mac SE/30 with a hard-disk drive, or Mac II series. $795. Letraset, 40 Eisenhower Dr., Paramus, NJ 07953. (800) 343-8973 or (201) 845-6100. (June '90)

Fast Forms ‡‡‡‡½

Fast Forms is a modest, inexpensive program that meets any simple, straightforward forms-design need. The program lets you create fields, overlay them with a scanned image, and fill in information electronically. It comes with Fast Forms Filler, which allows forms to be filled out electronically without use of the original program. It can't import EPS graphics. If you just want to knock out a form or two and don't want to spend a lot, Fast Forms is for you. Version 2.0. $179.95; upgrade, $25. Power Up Software Corp., 2929 Campus Dr., San Mateo, CA 94403. (800) 851-2917 or (415) 345-5900. (Sept '90)

FlexForm Business Templates ‡‡‡‡½

FlexForm Business Templates are two volumes of prepackaged business forms. Includes SmartForm Assistant. Volume I contains stockkeeping, production, sales, billing, and collection; Volume II has purchasing, receiving, accounting, disbursing, and personnel. $89.95 per volume. Antic Software, 544 Second St., San Francisco, CA 94107. (415) 957-0886. (Jan '90)

FormSet: Business Forms Edition ‡‡‡

FormSet: Business Forms Edition provides a wealth of business forms, such as expense reports and profit/loss statements. Fields are automatically calculated. Can't be customized beyond adding a logo. Version 1.4. Requires Mac 512Ke or later. $95. Softview, Inc., 1721 Pacific Ave., Suite 100, Oxnard, CA 93033. (800) 622-6829 or (805) 385-5000. (Jan '89)

FrameMaker ‡‡‡‡½

FrameMaker is a powerhouse page-layout program with cross-platform compatibility. Its indisputable prowess in cross-referencing, support in long-document processing, and numerous other bells and whistles make it a winner. Good for technical publishing. Version 2.1. Requires Mac SE/30 or II with 4 megabytes of RAM, System 6.0.2 or later, 40-megabyte hard-disk drive, PostScript printer, and large-screen monitor. $995. Frame Technology, 1010 Rincon Circle, San Jose, CA 95131. (408) 433-3311. (Nov '90)

Informed Designer ‡‡‡‡½

Informed Designer is a comprehensive forms-design package that is targeted toward high-volume, complex forms design. It has a full complement of design tools and full-color capability. The program includes more than 150 mathematical, financial, and statistical functions. A related product, Informed MiniManager, acts as a flat-file-database manager that lets you merge or import data in a variety of ways. Version 1.0.1. $295; Informed MiniManager, $99. Shana Corp., Advanced Technology Center, Suite 105, 9650 20th Ave., Edmonton, Alberta T6N 1G1, Canada. (403) 463-3330. (Sept '90)

Interleaf Publisher ‡‡‡½

Interleaf Publisher is a speedy multiuser layout system for producing large, complicated documents. This version has an improved user interface, but it still suffers from poor font management. Version 3.6. Requires Mac II series with 5 megabytes of RAM and a hard-disk drive. $995; upgrade, $99. Interleaf, Inc., 10 Canal Park, Cambridge, MA 02141. (800) 456-5323 or (617) 577-9800. (Apr '89)

Layouts ‡‡‡‡½

Layouts is a five-disk set of PageMaker templates. The business-document templates are excellent. The superb manual has money-saving printing tips. Versions for QuarkXPress and Ready,Set,Go! are also available. Requires Mac Plus or later. $179. Starburst Designs, 1973 N. Nellis Blvd.,

Suite 315, Las Vegas, NV 89115. (702) 453-3371. (May '90)

Multi-Ad Creator ★★★★½

Multi-Ad Creator is a powerful tool that lets you create high-quality single-page ads. It is easy to use and is nearly foolproof (it doesn't have a good-taste feature, however.) Virtually every kind of graphic and most word-processor files can be imported. If you create ads, get it. Version 2.1. Requires Mac Plus or later. $995. Multi-Ad Services, 1720 W. Detweiller Dr., Peoria, IL 61615. (309) 692-1530. (June '90)

Page Designs Quick! (PDQ!) ★★★★½

Page Designs Quick! (PDQ!) and Page Designs Quick! 5 (PDQ! 5) are PageMaker templates aimed exclusively at newspaper publishing. The two sets contain many templates: 60 three-column, 60 four-column, and 225 tabloid-sized five-column layouts. The quality is excellent, but the templates are bare bones, with no art. You can modify all layouts from within PageMaker. PDQ!, $89.95; PDQ! 5, $159.95. PAR Publishing, 6355 Topanga Canyon Blvd., Suite 307, Woodland Hills, CA 91367. (818) 340-8165. (Aug '90)

PageMaker ★★★★

PageMaker's latest upgrade offers significant advances in word-processing, typography, and long-document processing. The story editor, document linking, and indexing features are especially nice. Missing or poorly implemented features keep it short of perfection, however. Version 4.0. $795; upgrade from any previous version, $150. Aldus Corp., 411 First Ave. S., Seattle, WA 98104. (800) 333-2538 or (206) 622-5500. (Sept '90) ★'85, '87, '88 Eddy

PageMaker Portfolio: Designs for Newsletters ★★★★

PageMaker Portfolio: Designs for Newsletters provides 21 newsletter templates with preset columns, headlines, graphics, and captions. Documentation provides excellent tutorial in page design. Versions for Manuals and Business Communications also available. Requires Mac Plus or later and PageMaker. $99 each. Aldus Corp., 411 First Ave. S., Seattle, WA 98104. (800) 333-2538 or (206) 622-5500. (May '87)

Publish It! ★★★★

Publish It! is a moderately priced page-layout package designed for users with Pluses and SEs. Includes word-processing and simple drawing and painting tools. Works using a frame metaphor. Can rotate text. Limited color support. Version 1.1. Requires Mac 512Ke or later and System 4.2 or later; System 6.0 or later preferred. $495. Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015. (708) 948-9200. (Dec '89)

Publish It! Easy ★★★★

Publish It! Easy keeps page layout simple with a full complement of drawing, painting, and layout tools, but it trades a few of the more advanced tools for a lower price and a simplified, responsive interface. This inexpensive, easy-to-use program delivers enough high-end features to make it attractive for doing DTP on a budget. Version 1.10. $199. Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015. (800) 535-9497 or (708) 948-9200. (Sept '90)

QuarkStyle ★★★★

QuarkStyle is a collection of 72 templates for "instant" desktop publishing. The templates, which cover the gamut from business cards to newsletters, let you concentrate on a page's contents rather than its appearance. Version 1.01. Requires 1 megabyte of RAM and a hard-disk drive. $295. Quark, Inc., 300 S. Jackson, Suite 100, Denver, CO 80209. (800) 356-9363 or (303) 934-2211. (Feb '89)

QuarkXPress ★★★★½

QuarkXPress may be the program of choice for high-end color publishing on the Macintosh. It has a brilliantly redesigned interface and dozens of new features, including interactive palettes, libraries, rotation to any degree, and 127 master pages. Version 3.0. Requires Mac Plus with 2 megabytes of RAM and a hard-disk drive. $795. Quark, Inc., 300 S. Jackson, Suite 100, Denver, CO 80209. (800) 356-9363 or (303) 934-2211. (Nov '90) ★'89 Eddy

RagTime ★★★½

RagTime is a page-layout program with extensive spreadsheet capabilities and powerful drawing tools. Spreadsheets and graphs can be linked so that they update each other dynamically. There are still some gaps (rotation of text is limited, for example) and lots of rough edges. The manual needs to be localized to America. Version 3.04. Requires Mac Plus or later. $599. RagTime USA, 702 Marshall St., Suite 322, Redwood City, CA 94063. (415) 780-1800. (June '90)

Ready,Set,Go! ★★★★½

Ready,Set,Go! combines an elegant interface with style sheets, fine-tuned typography, gray-scale editing, and spot color. It's the only program that provides thumbnail views of publications, which lets you rearrange pages. It's one of the first programs to store font information with documents, thus avoiding font-ID conflicts. Version 4.5a. Requires Mac Plus and a hard-disk drive. $295. Letraset, 40 Eisenhower Dr., Paramus, NJ 07653. (800) 343-8973 or (201) 845-6100. (Jan '90).

SmartForm Designer ★★★★

SmartForm Designer is a full-featured forms-design and -management program. Includes SmartForm Assistant for forms fill-out and handling. Easy-to-use design environment. Imports color graphics. Requires Mac Plus. Version 1.1.v1. $399. Claris Corp., 5201 Patrick Henry Dr., Santa Clara, CA 95052. (800) 544-8554 or (408) 727-8227. (Jan '90)

Springboard Publisher II ★★

Springboard Publisher II is a second try at a low-end template-based DTP package. It's no better than the original program, unfortunately. The interface is poorly designed. Editing works only in the Actual Size view, which makes large changes awkward and difficult to preview. The text editor is far too slow, even on fast Macs. There are better tools for low-end DTP. Version 2.0. Requires Mac Plus or later. $199.95. Spinnaker Software Corp., 201 Broadway, Cambridge, MA 02139. (800) 826-0706 or (617) 494-1200. (Apr '90)

TrueForm ★★★★

TrueForm creates an electronic form by scanning a preexisting paper one or importing from another design environment. No design capabilities. Automatic field definition. Has form caching for faster printing. The only forms package with a database link. Version 2.0. Requires Mac Plus and System 6.0 or later. TrueForm Set-Up, $395; TrueForm Fill-Out four-pack, $495. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039-7900. (800) 344-8335 or (415) 961-4400. (Jan '90)

• PRESENTATIONS

CA-Cricket Presents ★★★★

CA-Cricket Presents is a presentation tool with a strong graphics emphasis. Good master template. Lacks import capability for text. Version 2.0. Requires Mac Plus or later with 1 megabyte of RAM, System 6.0 or later, and a second disk drive or hard-disk drive. $495. Computer Associates International, Inc., 711 Stewart Ave., Garden City, NY 11530. (800) 531-5236. (Dec '88)

Persuasion ★★★★½

Persuasion is the premier desktop-presentation program. Templating and outlining abilities have been improved considerably, and slide shows are handled well. There are very few flaws in this package. Version 2.0. Requires Mac Plus or later, System 4.1 or later, and a hard-disk drive. $495. Aldus Corp., 411 First Ave. S., Seattle, WA 98104. (800) 333-2538 or (206) 622-5500. (Apr '90) ★'88 Eddy

PowerPoint ★★★★

PowerPoint is an easy-to-use desktop-presentation tool. Good color schemes. Can send presentations to Genigraphics to produce color 35mm slides. Version 2.01. Requires Mac Plus or later with 1 megabyte of RAM, System 4.1 or later, and two 800K drives or a hard-disk drive. $395. Microsoft Corp., One Microsoft Way, Redmond, WA 98052. (800) 426-9400 or (206) 882-8080. (Aug '87) ★'87 Eddy

StandOut! ★★★★

StandOut! is a presentation program that's built like a publishing program, with strong text and graphics support. Automatic text flow around graphic objects. Lacks good graphic examples. Version 1.0. Requires Mac Plus or later. $295. Letraset, 40 Eisenhower Dr., Paramus, NJ 07653. (800) 343-8973 or (201) 845-6100. (Nov '88)

GRAPHICS AND DESIGN

Capture ★★★★½

Capture is a most reliable screen-capture utility. Can capture full screens or any area to either the Clipboard or a PICT file. Supports 8- and 32-bit color. May have to be renamed to avoid INIT conflicts. Version 3.0. Requires System 5.0 or later. $79.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. (818) 991-6540. (Jan '90)

ClickPaste ★★★½

ClickPaste puts the functionality of an ordered Scrapbook at the tip of your cursor. Most useful if you cut and paste frequently to and from your Scrapbook. Version 2.0. Requires Mac Plus or later and System 6.0 or later. $99.95. Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301. (818) 991-6540. (Sept '89)

The Curator ★★★★½

The Curator catalogs your art and graphics so it's easy to see what's what and where it is. Supports PICT, TIFF, EPS, PostScript, MacPaint, and more. Changes creator types. Version 1.05. Requires Mac 512K or later. $139.95. Solutions, Inc., 30 Commerce St., P.O. Box 783, Williston, VT 05495. (802) 865-9220. (Sept '88)

MiniFinders

Enhance ★★★★½
Enhance, a low-priced image processor, is suited for researchers with light data-extraction needs as well as graphic artists who have some familiarity with image processing. It has some measurement tools but stands out with its first-class graphics tools for photo retouching. Version 1.01. $375. MicroFrontier, 7650 Hickman Rd., Des Moines, IA 50322. (800) 388-8109 or (515) 270-8109. (July '90)

Flexigraphs ★★★★½
Flexigraphs starts with basic charts and lets you modify them in a staggering variety of ways. The simple, elegant interface lets you add attractive details and work on certain parts of charts while locking other areas down. Version 1.0. Requires Mac Plus or later. $179. TreeStar, 1802 Hillside Rd., Santa Barbara, CA 93101. (805) 682-4096. (Apr '90)

Image Analyst ★★★★½
Image Analyst, a feature-packed image-processing program, may amaze professionals who have worked with high-end image-processing systems. In a matter of minutes — and without any programming — you can set up a process to identify and analyze any element of an image. Measurements and statistics can be automatically or interactively generated from TIFF or PICT files or from captured video images. The program directly supports Data Translation and Scion frame grabbers. Version 7.1. $2,000. Automatix, 1000 Tech Park Dr., Billerica, MA 01821. (508) 667-7900. (July '90)

Image Studio ★★★★½
Image Studio puts a photo-retouching lab on the desktop. Editable brushes let you modify digitized images in 65 gray levels. Version 1.5. Requires Mac Plus or later with 1 megabyte of RAM and a hard-disk drive. $250. Letraset, 40 Eisenhower Dr., Paramus, NJ 07653. (800) 343-8973 or (201) 845-6100. (June '88)

LANDesign ★★★★½
LANDesign is versatile land-surveying software. It has a range of options that allow it to work the way surveyors worked before they had a Macintosh to help them. This intelligent program is quite easy to use. Version 1.13. Requires Mac Plus or later; hard-disk drive recommended. $595. Compuneering, Inc., 113 McCabe Crescent, Thornhill, Ontario L4J 2S6, Canada. (416) 738-4601. (Sept '89)

Mariah ★★★★½
Mariah (formerly PictureBase) is a powerful graphics-librarian program. Can store paint- and PICT-formatted items and attach keywords for later search and retrieval. Version 1.0. Requires Mac 512Ke or later and System 4.1 or later. $149; upgrade from PictureBase, $30. Symmetry Software Corp., 8603 E. Royal Palm Rd., Suite 110, Scottsdale, AZ 85258. (800) 624-2485 or (602) 998-9106. (Sept '87) ★'86 Eddy

MultiClip 2.0 ★★★★½
MultiClip 2.0, a much-improved version of an already good product, gives you many Clipboards. Makes many graphics and page-layout applications easy to use. Version 2.0. Requires Mac Plus or later with 1 megabyte of RAM. $129. Olduvai Corp., 7520 Red Rd., Suite A, South Miami, FL 33143. (800) 822-0772 or (305) 665-4665. (Oct '90)

PhotoMac ★★★★
PhotoMac is a powerful color-retouching tool for photographs in PICT and TIFF. Displays and edits in 8-bit mode; saves in 8- or 24-bit modes. Makes color separations, but process requires substantial disk space. Version 1.5. Requires Mac II with 2 megabytes of RAM, color monitor, 8-bit video card, 32-bit QuickDraw, and a hard-disk drive. $795. Data Translation, 100 Locke Dr., Marlboro, MA 01752. (508) 481-3700, ext. 649. (July '89)

Photoshop ★★★★★
Photoshop, a 32-bit photo-retouching program, combines powerful image-editing capabilities with a friendly interface. It's not a substitute for a high-end dedicated system, but it makes powerful photo editing accessible, painless, and easy. The better you know Photoshop, the more you benefit from its tools, modes, options, and special layers. Version 1.0. $895. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (July '90)

PictureBook ★★★★★
PictureBook is a superb Scrapbook replacement. It catalogs your Scrapbook and lets you resize and/or crop anything that can be copied to the Clipboard. There's a lot of power here, and the interface is excellent. Version 3.2. Requires Mac 512K or later; hard-disk drive recommended. $69.95. Loop Software, P.O. Box 1249, Menlo Park, CA 94026. (800) 288-7631. (Sept '89)

Smart Art ★★★★★
Smart Art is a nifty PostScript utility disguised as a DA. It creates special effects with both text and graphics, and it lets you print directly from the program or export EPS files. Volumes I, II, and IV offer various text effects; Volume III works with graphic shapes. Version 1.0. Requires Mac Plus or later with 1 megabyte of RAM, System 6.0.2 or later, and PostScript printer. $149. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (Oct '89)

SmartScrap and The Clipper II ★★★★½
SmartScrap and The Clipper are two useful DA utilities for graphics work. SmartScrap is a major enhancement to the standard Scrapbook DA. The Clipper provides a transparent Clipboard window that lets you resize or crop a graphic to the area in which it will be pasted. Version 2.01. Requires Mac Plus or later and System 6.0 or later. $89.95. Solutions, Inc., 30 Commerce St., P.O. Box 783, Williston, VT 05495. (802) 865-9220. (July '87) ★'87 Eddy

SnapJot ★★★★★
SnapJot is a utility that lets you capture screens or parts of screens. Differs from similar products in that the captured window remains on-screen in a real window and you can use it as you work. Version 3.0. Requires System 4.1 or later. $59.95. Wildflower Software, 21W171 Coronet Rd., Lombard, IL 60148. (708) 916-9360. (Oct '89)

Streamline ★★★½
Streamline is Adobe's dedicated PostScript auto-trace package. Auto-tracing is all it does. Can quickly produce nearly print-ready traces with little tweaking. Retains original images' black-and-white values. Final touch-ups must be completed in Illustrator 88 or a similar program. Expensive for a single-function utility. Version 1.02. Requires Mac Plus or later and System 4.2 or later; 2 megabytes recommended. $395. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (Nov '89)

• CAD

Ashlar Vellum ★★★★½
Ashlar Vellum is an entirely new type of CAD package with artificial-intelligence elements. The cursor can inform you about its exact position (midpoint, end, and so on). Its full set of tools includes a library of resizable parametric shapes. Performance is good if you have a fast Mac and lots of RAM (at least 4 megabytes). Can import and export DXF, but not IGES, files. Version 1.0. Requires Mac II series or SE/30. $995. Ashlar, 1290 Oakmead Pkwy., Suite 218, Sunnyvale, CA 94086. (408) 746-2980. (May '90) ★'89 Eddy

Blueprint ★★★★
Blueprint is a low-cost 2-D CAD program that is particularly useful for architectural drafting. It has strong support for precision over drawing and output. Control over colors as well as patterns is excellent. The program needs only 590K and runs comfortably with 1 megabyte of RAM, making it a good choice for users on a budget. Version 1.0V6. $449. Graphsoft, 8370 Court Ave., Suite 202, Ellicott City, MD 21043. (301) 461-9488. (July '90)

Design Your Own Home: Architecture ★★★½
Design Your Own Home is a specialized drawing program that produces simple housing floor plans and elevations. Its built-in parts libraries and many sample plans (more are available separately) make the job easy. It's a decent drawing program. Requires Mac Plus or later. $99.95; additional design libraries, $29.95 each. Abracadata, P.O. Box 2440, Eugene, OR 97402. (503) 342-3030. (May '90)

DynaPerspective ★★★★½
DynaPerspective is a 3-D CAD program that features an ability to create fly-through animations easily, which is ideal for creating presentations. Drafting capabilities have been added, rendering tweaked, and animations made faster and smaller. The biggest void is a method for measuring relative distances. This is a powerful and versatile tool and a great value. Version 2.02. Requires Mac II, 2 megabytes of RAM, 8- or 24-bit-color card; hard-disk drive recommended. $995. DynaWare USA, 950 Tower Lane, Suite 1150, Foster City, CA 94404. (800) 445-3962 or (415) 349-5700. (Dec '90)

MacDraft ★★★★½
MacDraft is an object-oriented drawing program that offers a rich set of features at a low price. Object rotation is precise, and the program accesses the full spectrum of 16.7 million colors. It is particularly appropriate for high school or college-level introductory CAD classes or for small architectural/construction contracting businesses. Version 2.1. Requires Mac Plus or later, System 6.0.2 or later, 1 megabyte of RAM, and a second disk drive. $299. Innovative Data Design, 2280 Bates Ave., Suite A, Concord, CA 94520. (415) 680-6818. (Oct '90)

MGMS: Professional CAD for Macintosh ★★★★
MGMS: Professional CAD for Macintosh offers more than 200 functions. Very complete, capable program. Groups, dimensions, and libraries are

standard. Sometimes confusing — designed for experienced CAD users, not novices. Full plotter support. Version 2.5. Requires Mac 512K or later. Black-and-white, $999; color, $1,399. Micro CAD/CAM, 2335 Alaska Ave., El Segundo, CA 90245. (213) 536-9207. (Nov '87) ★'87 Eddy

MiniCAD+ ⭐⭐⭐⭐

MiniCAD+ separates itself from its competition by incorporating a Pascal-like macro language, 3-D graphics, and a spreadsheet. Has a MacDraw-like feel, but added features compete with Claris CAD. May have the best 3-D capabilities among low-cost CAD programs. Version 3.0. Requires Mac Plus or later, System 6.0, and a hard-disk drive; 2 megabytes recommended. $795. Graphsoft, 8370 Court Ave., Suite 202, Ellicott City, MD 21043. (301) 461-9488. (Dec '89)

ModelShop ⭐⭐⭐½

ModelShop is a powerful 3-D modeling package. It needs many navigational and editing improvements to match its powerful feature set, however. Procedures not only differ from what you expect but often require too many steps. Version 1.1. Requires Mac Plus or later and a hard-disk drive. $595. Paracomp, Inc., 1725 Montgomery St., Second Floor, San Francisco, CA 94111. (415) 956-4091. (Apr '90)

Precision ⭐⭐⭐

Precision is a 2.5-D CAD program with some quirks. The Cut and Paste functions operate oddly, and many things don't work as expected. The program is powerful but slow. It freezes and crashes at times. When these problems are cleaned up, it should be superb. Version 1.2. Requires Mac II or later or SE/30. $295. Innovative Systems, 171 Interstate Dr., West Springfield, MA 01089. (800) 222-1648 or (413) 737-3993. (Apr '90)

StrataVision 3d ⭐⭐⭐⭐

StrataVision 3d brings mainframe rendering power to the Mac, provided you have a lot of RAM and a lot of patience. It's a modeling and visualization tool that can create photorealistic 3-D images. Rendering is very slow — it can take hours. It can also be done in the background so you can do other work. Precision options are conspicuously lacking. Version 1.4.2. Requires Mac II series with FPU, a hard-disk drive, and at least 2 megabytes of RAM. $495; $39 for each of five libraries. Strata, Inc., 2 W. St. George Blvd., Ancestor Square, Suite 2100, St. George, UT 84770. (800) 678-7282 or (801) 628-5218. (May '90)

VersaCAD ⭐⭐⭐⭐

VersaCAD is a powerful CAD program that doesn't show any of its DOS roots. Excellent element manipulation, full plotter support. Library user interface is crude. Version 2.2. Requires Mac Plus or later. $1,995. Versacad, 2124 Main St., Huntington Beach, CA 92648. (714) 960-7720. (July '88) ★'88 Eddy

Visual Information Manager ⭐⭐⭐½

Visual Information Manager combines a CAD program with a database. Some of its numerous features are difficult to access, but the package is very useful overall. The database is a decent flat-file manager; the drawing portion of the package has color support, infinite zoom, libraries, and many other powerful tools. Version 1.02. Requires Mac II or later. $795. Aperture Technology, 84 W. Park Pl., Stamford, CT 06901. (203) 975-7587. (Apr '90)

• Clip Art

Artbeats ⭐⭐⭐⭐⭐

Artbeats is a series of superb high-tech EPS backgrounds. Five packages — Dimensions 1 and 2, Potpourri, and Natural Images 1 and 2 — offer abstract, geometric, and natural images. Each package contains 20 full-page backgrounds, saved as both FreeHand and EPS files. Be forewarned: These complex images demand RAM and take a while to print, but the results are worth it. Also available on a CD-ROM disc. $79.95 to $129.95. Artbeats, P.O. Box 20083, San Bernardino, CA 92406. (714) 881-1200. (Nov '90)

ArtClips ⭐⭐⭐

ArtClips offers two collections of EPS artwork. One package focuses on graphics and symbols, the other on business images. Odd assortment of images that have limited usefulness. Includes ArtSymbol font. Version 1.0. Requires Mac Plus or later. First edition, $99; second edition, $129. Tactic Software Corp., 11925 S.W. 128th St., Miami, FL 33186. (800) 344-4818 or (305) 378-4110. (Aug '89)

Click & Clip 500 ⭐⭐⭐

Click & Clip 500 is a collection of 500 general-purpose EPS images. Most images are average-quality line art. Packages are issued quarterly, and specialized packages are available on topics such as the military and medicine. Quarterly editions vol. 1–10, $39.95; C&C 500, $395; C&C Military Art v1.1, Medical/Health v1.3, and Business v1.5, $149 each; Road and Warning Signs v1.2 and International Symbols v1.6, $99 each; Borders v2.8, $79; Christmas v2.2 and Seasonal v2.2, $19.95 each. Studio Advertising Art, 4305 E. Sahara, Suite 1, Las Vegas, NV 89104. (702) 641-7041. (Aug '88)

ClickArt ⭐⭐⭐⭐

The ClickArt series consists of six MacPaint and four EPS packages. Themes include business, sports, animals and nature, holidays, religion, and cartoons. The artwork is generally well drawn, although some collections are a bit unfocused. Not the most sophisticated clip art, but it serves general purposes quite well. MacPaint packages include the useful ClipOut DA and a HyperCard stack. MacPaint packages, $49.95; EPS offerings, $129.95. T/Maker, 1390 Villa St., Mountain View, CA 94041. (415) 962-0195. (Nov '90)

Clipables ⭐⭐⭐⭐

Clipables is an enormous collection of EPS artwork. The 600 images — a whopping 10 megabytes of data — are generally well drawn and cover a wide range of topics. This is a broad — but shallow — package that has some notable omissions and occasional miscues. Few other collections offer so much for so little, however. Periodic supplements and a CD-ROM disc are planned. $149.95. C.A.R., 7009 Kingsbury, St. Louis, MO 63130. (314) 721-6305. (Nov '90)

Clip3D ⭐⭐⭐

Clip3D is a series of 3-D clip-art collections bundled with Pro3D, an editing program. Eight theme packages include Fonts, People, and Geography. Images are in color, but quality is only fair. After editing, images can be exported in common file formats. On a Mac II, DAs don't work while Pro3D is active. $99 per package. Enabling Technologies, 600 S. Dearborn, Suite 1304, Chicago, IL 60605. (312) 427-0408. (Aug '89)

Cliptures ⭐⭐⭐⭐

Cliptures offers three volumes of EPS clip art, two on business and one on sports. Image quality is good, and files contain keywords for cataloging with Curator. $129.95. Dream Maker Software, 7217 Foothill Blvd., Tujunga, CA 91041. (800) 876-5665 or (818) 353-2297. (Aug '89)

Collector's Edition ⭐⭐⭐⭐⭐

The Adobe Collector's Edition offers excellent selections of basic graphic elements for Illustrator users. The first package, Symbols, Borders & Letterforms, contains a wide range of dingbats, borders, and two editable alphabets. The Patterns and Textures package provides more than 400 patterned fills for use in architecture and mapmaking. All files are in Illustrator format and must be saved as EPS files before you can import them into other programs. Symbols, Borders & Letterforms, $125; Patterns and Textures, $225. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (Nov '90)

Comic People, Volume 2: Kid Stuff ⭐⭐⭐⭐

Comic People, Volume 2: Kid Stuff is a set of Comic Strip Factory add-ons that were drawn by Trici Venola and Kurt Wahlner. Extraordinary quality and range. Kid Stuff presents five children and two grown-ups of both sexes and various ethnic backgrounds. Also included are backgrounds, sound effects, a very spry cat, and some Little Extras. Requires Mac 512K or later and Comic Strip Factory. $39.95. Foundation Publishing, Inc., 14228 Shore Ln., Prior Lake, MN 55372. (612) 445-8860. (Aug '90)

Digit-Art ⭐⭐⭐

Digit-Art is a series of EPS clip art available on disk and CD-ROM. The 20-volume collection has various themes; three volumes also contain PICT images. The images have a stylized "hip" look that is often cartoonish. The ArtRoom CD-ROM contains all the clip art plus several fonts and templates. Disk, $99 per volume; CD-ROM disc, $799. Image Club Graphics, Inc., 1902 11th St. S.E., Calgary, Alberta T2G 3G2, Canada. (800) 661-9410. (Aug '88)

Images with Impact! ⭐⭐⭐⭐⭐

Images with Impact! is three collections of superb, imaginative EPS clip art. The Business package contains 175 images of people, equipment, and office situations. Graphics & Symbols is a more general package covering a variety of topics and drawing styles. Accents & Borders contains 270 design elements, including borders, frames, ornaments, symbols, and mortises. Registered users receive a bonus disk of color artwork. Images are opaque and most are strategically subgrouped for easy editing. Excellent manual. Business, $129.95; Graphics & Symbols, $99.95; Accents & Borders, $129.95. 3G Graphics, 11410 N.E. 124th St., Suite 6155, Kirkland, WA 98034. (206) 823-8198. (Nov '90)

MacGallery ⭐⭐⭐⭐

MacGallery is a whimsical collection of MacPaint images that are ideal for children's publications, newsletters, fliers, and invitations. The 400 original illustrations include holidays, sports, teddy bears, dinosaurs,

food, and more. The manual offers excellent advice on working with MacPaint images. $49.95. Dream Maker Software, 7217 Foothill Blvd., Tujunga, CA 91041. (800) 876-5665. (Nov '90)

MacGraphics ‡‡‡

MacGraphics is a collection of MacPaint clip art — 13 thematic disks with 10 megabytes of art. Unfortunately, most pictures are full-page, and reproduction quality suffers when they are reduced. Version 3.0. $245. GoldMind Publishing, 12155 Magnolia Ave., Suite 3-B, Riverside, CA 92503. (714) 687-3815. (Jan '89)

Metro ImageBase Electronic Art ‡‡‡‡

This 14-package series contains 300-dpi TIFF images on various themes. The images have a traditional hand-sketched look often seen in newspapers. The files are huge and must be unstuffed before use, so have a large hard-disk drive handy. $145. Metro ImageBase, 18623 Ventura Blvd., Suite 210, Tarzana, CA 91356. (800) 525-1552. (Aug '89)

The Professional Photography Collection, Volume 1 ‡‡‡‡‡

The Professional Photography Collection, Volume 1, CD-ROM disc contains 100 color TIFF images. Comes in 24-bit high-resolution color, 24-bit low-resolution color, and 8-bit black-and-white formats. The high-quality images are strikingly clear. A printed catalog, a liberal rights policy, and the surprisingly low cost for photos of this quality make this first volume an excellent buy. $149. disc*imagery*, 18 E. 16th St., New York, NY 10003. (212) 675-8500. (Sept '90)

650-Megabyte Clip-Art Disk ‡‡‡

The 650-Megabyte Clip-Art Disk is a CD-ROM disc that contains 182 TIFF scanned images and 886 mostly color EPS files in Illustrator 88 format. Many of the EPS files are typical, unattractive examples of the clip-art genre, and some of them are misfiled. The quality of the scans is adequate, but many images are marred by washed-out colors or are too dark to be useful without modification. $499.95. Media Clip-Art, 1879 Old Cuthbert Rd., Unit 10, Cherry Hill, NJ 08003. (609) 795-5993. (Sept '90)

Totem Graphics ‡‡‡‡‡

Totem Graphics contains 12 volumes of PostScript images in 24-bit color. Color blends and fine details look superb even when printed in black-and-white. The 12 categories emphasize animals and plants but also include holidays, food, sports, hardware, and people. Requires 2 megabytes of RAM. Each volume (96 images), $95; each category, $125; all 12 volumes, $995. Totem Graphics, 5109A Capitol Blvd., Tumwater, WA 98501. (206) 352-1851. (Nov '90)

Vivid Impressions ‡‡½

Vivid Impressions: Special Events is cartoonish EPS clip art, some of it in color. The holiday-oriented package contains 130 images, many of them slightly altered duplicates. Requires Mac Plus or later. Version 1.0. $65. Casady & Greene, Inc., P.O. Box 223779, Carmel, CA 93922. (800) 359-4920 or (408) 624-8716. (Aug '89)

WetPaint ‡‡‡‡‡

WetPaint is a ten-volume series that contains massive quantities of well-drawn MacPaint graphics. The best-seller is Classic Clip Art; other titles include Publishing, Animal Kingdom, Special Occasions, Industrial Revolution, Island Life, and All the People. Art styles range from line drawings to digitized images to woodcuts and other "antique" graphics. MacTut is a unique collection of ancient Egyptian artwork that includes hieroglyphic fonts. All the packages include the ArtRoundup and Pattern Mover DAs. $79.95 each; MacTut, $49.95. Dubl-Click Software, Inc., 9316 Deering Ave., Chatsworth, CA 91311. (818) 700-9525. (Nov '90)

• DRAWING AND PAINTING

Azimuth ‡‡‡½

Azimuth is a solid map-making program that lets you build maps of the earth based on a viewpoint in space. The program produces excellent maps but has interface problems. Its selection of export formats is too limited, often rendering its nice output difficult to use. Version 1.0. Requires Mac Plus or later. $395. Graphsoft, 8370 Court Ave., Suite 202, Ellicott City, MD 21043. (301) 461-9488. (Apr '90)

CA-Cricket Draw ‡‡

CA-Cricket Draw is an object-oriented drawing program that produces high-quality output. Designed to print on PostScript-compatible devices. Version 1.1.1. Requires Mac Plus or later with 1 megabyte of RAM, System 6.0 or later, and second disk drive or hard-disk drive. $295. Computer Associates, 711 Stewart Ave., Garden City, NY 11530. (800) 531-5236. (May '87)

Canvas ‡‡‡‡‡

Canvas is a rich drawing/painting program, featuring full Bezier curves, the cutting and joining of polygons, skewing, perspective and distortion, area and perimeter calculation, auto-dimensioning, auto-tracing of bit maps, and full color support. Creates and edits high-resolution bit maps to 2,540 dpi. Slightly less powerful DA version available. Version 2.1. Requires Mac Plus or later and System 6.0.2 or later. $299.95. Deneba Software, 3305 N.W. 74th Ave., Miami, FL 33122. (305) 594-6965. (Apr '89) ★ '89 Eddy

Color MacCheese ‡‡‡½

Color MacCheese, an inexpensive full-color painting program, gives you all the color-manipulation capabilities of a MacPaint standard and is basically designed for graphics fun. Resolution is limited to 72 dpi, and there are no rulers. Only one document can be open at a time. MacCheese documents can be saved as color PICT files, and the program can also open MacPaint documents. MacCheese has responsive tools even when you are working in color. For casual painters or sketch artists who want to get to work immediately, MacCheese is perfect. Version 1.03. $99. Delta Tao Software, 760 Harvard Ave., Sunnyvale, CA 94087. (408) 730-9336. (Nov '90)

The Comic Strip Factory ‡‡‡‡½

The Comic Strip Factory is an assembly program for creating comic strips. Includes a database of parts for various characters and backgrounds for panels. Good text editing in balloons. Can import and export in MacPaint format. Version 1.6. Requires Mac 512K or later. $69.95. Foundation Publishing, Inc., 14228 Shore Ln., Prior Lake, MN 55372. (612) 445-8860. (Dec '87)

Crystal Paint ‡‡‡

Crystal Paint creates an electronic kaleidoscope. It's MacPaint's Brush Mirrors gone wild in a small and simple yet wonderful application. Doesn't work in color on Mac II. Requires Mac 512K or later. Version 1.0. $49.95. Great Wave Software, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. (408) 438-1990. (Feb '88)

DeskPaint ‡‡‡‡½

DeskPaint is a full-featured precision painting program in DA form. It comes bundled with DeskDraw, its object-oriented equivalent. The package has tutorial/reference manuals that total 350 pages. You can calibrate vertical and horizontal rulers in inches, centimeters, millimeters, picas, or points/pixels. Has many different image-manipulating functions. Version 3.01. $199.95. Zedcor, 4500 E. Speedway, Suite 22, Tucson, AZ 85712. (602) 881-8101. (Nov '90)

Draw Tools ‡‡‡‡

Draw Tools self-installs three DAs directly into MacDraw II. Sizer does exact scaling and dimensioning, calculates enclosed areas, and lets you resize a drawing. Adjacency brings together any two selected objects. Tools adds a handy menu that lets you clip or extend existing lines and build fillets. There are some limitations on the use of tools, and sometimes the tools are a bit awkward to use. Draw Tools make an excellent add-on for users of regular MacDraw II, overall. Version 1.1.1. Requires Mac Plus or later and MacDraw II version 1.0v4 or 1.1v2. $99.95. Paracomp, Inc., 1725 Montgomery St., Second Floor, San Francisco, CA 94111. (415) 956-4091. (July '90)

Easy Color Paint ‡‡‡‡

Easy Color Paint is a low-cost, rather basic 8-bit (256-color) painting program. It can print to color QuickDraw printers. Four color palettes, as well as two pattern palettes, are available. Each palette has 38 patterns, and 1 is totally user-definable. All the standard tools are here. This program doesn't have all the bells and whistles, but it offers good performance, ease of use, and a low price. Poor manual. Version 1.1. $79. Creative Software, 55 Clinton Ave., New Providence, NJ 07974. (201) 665-9361. (Sept '90)

FreeHand ‡‡‡‡½

FreeHand is a major upgrade. Greatly increased power includes up to 100 levels of undo, auto-trace, a Blend command for interpolating shapes and colors, and expanded text manipulation. Has a steep learning curve but is relatively easy to use once you've gotten the hang of it. Version 2.0. Requires Mac Plus or later. $495. Aldus Corp., 411 First Ave. S., Seattle, WA 98104. (800) 333-2538 or (206) 622-5500. (June '89)

Illustrator 88 ‡‡‡‡½

Illustrator 88 is a professional-level graphics program from the people who defined the PostScript language. Uses templates for precise drawing and detailed artwork. Version 3.0. Requires Mac Plus or later. $595. Adobe Systems, Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039. (800) 344-8335 or (415) 961-4400. (Oct '88) ★ '88 Eddy

MacCalligraphy ‡‡‡½

MacCalligraphy simulates brush painting. User-designed Seals and Touches enable you to design your own signature tool and the style of brush you use. Takes some getting used to. Version 2.01. $149.95. Qualitas Trading Co., 6907

Norfolk Rd., Berkeley, CA 94705. (415) 848-8080. (Feb '88)

MacDraft ‡‡‡‡

MacDraft is an object-oriented graphics program. Has variable scaling, single-degree rotation, complex arcs, auto-dimensioning, and variable zoom/reduction. Version 1.2B. Requires Mac Plus or later. $269. Innovative Data Design, 2280 Bates Ave., Suite A, Concord, CA 94520. (415) 680-6818. (Feb '86)

MacDraw II ‡‡‡½

MacDraw II updates the venerable object-oriented drawing program. Although it adds dithered and color patterns in its own documents, it doesn't support color in PICT II format. Version 1.1v2. Requires Mac Plus. $395. Claris Corp., 5201 Patrick Henry Dr., Santa Clara, CA 95052. (800) 544-8554 or (408) 727-8227. (Nov '88)

MacPaint ‡‡½

MacPaint is a classic that hasn't kept up with the Joneses. Supports multiple windows, design templates, and a magic eraser for corrections. It lacks free-rotation and distortion talents. Probably our favorite piece of obsolete software. Version 2.0. Requires Mac 512K or later. $125. Claris Corp., 5201 Patrick Henry Dr., Santa Clara, CA 95052. (800) 544-8554 or (408) 727-8227. (July '88) ★'85, '87 Eddy

MapMaker ‡‡‡‡½

MapMaker is a digital cartographer that charts demographic and marketing information geographically. Wide variety of maps available — some at additional cost. Version 4.0. Requires Mac 512K or later. $395. Strategic Mapping, 4030 Moorpark Ave., Suite 250, San Jose, CA 95117. (408) 985-7400. (Dec '88)

Origins ‡‡‡

Origins is a 2-D-drafting and 3-D-rendering program with lots of rough edges. The point-orientation method of drawing takes some getting used to. Both versions have very busy, nearly overwhelming screens with long menus and huge palettes. Version 2.0.5. Requires Mac Plus or later for monochrome, Mac II or later for color. Monochrome, $495; color, $595. Deltasoft, P.O. Box 55089, Tulsa, OK 74155. (918) 250-5594. (Mar '90)

Photon Paint ‡‡½

Photon Paint is not the equal of Studio/8 or UltraPaint, but it does offer a workable painting environment, multiwindow capability, interesting special effects, and a lower price. Version 2.0. Requires Mac II with color card. $149.95. Micro-Illusions, 110815 Zelzah, Granada Hills, CA 91394. (800) 522-2041 or (818) 360-3715. (May '89)

PixelPaint ‡‡‡‡

PixelPaint is a professional 256-color (8-bit) painting program with a good interface, practical tools, and special effects. Works with many file formats. Four-color-separation capability is built in. Includes PixelScan utility for Sharp and Howtek color scanners that has excellent 8-bit imaging. Version 2.0. Requires Mac II series or SE/30 with 8-bit-color board and 2 megabytes of RAM, System 6.0.2 or later, a color monitor, and a hard-disk drive. $395. SuperMac Technology, 485 Potrero Ave., Sunnyvale, CA 94086. (408) 245-2202. (Oct '89)

PixelPaint Professional ‡‡‡‡

PixelPaint Professional is the 32-bit descendant of the original PixelPaint. Interface sometimes hides the well-designed painting tools' capabilities. Supports four 256-color palettes per document. Includes several color-blending and -manipulating tools as well as anti-aliasing. Still has a few glitches but is a serious and necessary tool for electronic artists, nevertheless. Version 1.0. Requires Mac II series or SE/30 with 8-, 16-, 24-, or 32-bit video card and 2 megabytes of RAM (4 megabytes for true color), System 6.0.5 or later, a hard-disk drive, and a color monitor. $799. SuperMac Technology, 485 Potrero Ave., Sunnyvale, CA 94086. (408) 245-2202. (Dec '89)

Relational Objex ‡‡‡½

Relational Objex (formerly Paradigm) is a drawing program with a difference. It does relational drawing (and does it very well) in which each point's position depends on the location of other points — if you move a point, the rest of the drawing reacts correspondingly. Version 1.0. Requires Mac Plus or later. $120. SoftStream International, Inc., 19 White Chapel Dr., Mount Laurel, NJ 08054. (800) 262-6610 or (609) 866-1187. (Mar '90)

Studio/8 ‡‡‡‡‡

Studio/8 is a professional color (8-bit, or 256-color) painting application that has a superior tool set, an elegant interface, and excellent performance and speed. Version 2.0. Requires Mac II series or LC and hard-disk drive; 2 megabytes of RAM recommended. $295. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. (800) 245-4525 or (415) 571-7171. (Jan '89) ★'88 Eddy

Studio/1 ‡‡‡‡½

Studio/1 is an excellent monochrome painting program that also has impressive flip-frame animation capabilities. You'll find an uncluttered animation surface, painting tools with 300-dpi capabilities, and a HyperCard playback utility (XCMD). Version 1.0. Requires Mac Plus or later. $149.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. (800) 245-4525 or (415) 571-7171. (Sept '89)

Super 3D ‡‡‡‡

Super 3D is an update of an excellent 3-D object-oriented drawing program. Powerful features such as Sweep are easy to use. Can save your 3-D models in VersaCAD format. Version 2.04. Requires Mac Plus or later. $495. Silicon Beach Software, Inc., P.O. Box 261430, San Diego, CA 92129. (619) 695-6956. (Mar '90)

SuperPaint ‡‡½

SuperPaint is the first upgrade of the original painting/drawing program. Some of the new features are plug-in tools, autotrace, Bezier curves, support for resolutions exceeding 300 dpi, and eight-color support. A good program but not particularly fast. Version 2.0. Requires Mac Plus or later. $199. Silicon Beach Software, Inc., P.O. Box 261430, San Diego, CA 92129. (619) 695-6956. (July '89)

Swivel 3D ‡‡‡‡‡

Swivel 3D quickly forms shaded solids in full color. Casts true shadows onto other objects and can project color graphics onto solids. Objects can be linked as jointed and sliding mechanisms that can be manipulated without accidental dismantling. It can tween-animate objects or fly your view through a scene, saving frames for playback. Superb object-manipulation interface. Version 1.2. Requires Mac Plus or later. $495. Paracomp, Inc., 1725 Montgomery St., Second Floor, San Francisco, CA 94111. (415) 956-4091. (Mar '89) ★'89 Eddy

UltraPaint ‡‡‡½

UltraPaint is a Swiss-army-knife-like 8-bit-color graphics program. Well suited for someone new to computer graphics and color, and experienced artists may also find it useful. For one package that does it all, this has all the basic tools. Version 1.0. $199. Deneba Software, 3305 N.W. 74th Ave., Miami, FL 33122. (305) 594-6965. (Sept '90)



HYPERMEDIA

Ali Baa Baa and the Forty Winks ‡‡‡‡½

Ali Baa Baa and the Forty Winks is an interactive bedtime adventure in which you fly away on a magic pillow to the dark, menacing Quilticombs to encounter dust-bunny villains. Nice illustrations. $22. Radical Sheep Productions, 62 MacDonell Ave., Toronto, Ontario M6R 2A2, Canada. (416) 531-7774. (Dec '89)

ArchiText ‡‡‡‡

ArchiText is a text processor with many hypertext capabilities as well as the ability to include graphics. "Nodes" of text are accessed by means of different "maps." Very powerful. Version 2.03. Requires Mac Plus or later. $395. BrainPower, 30497 Canwood St., Suite 201, Agoura Hills, CA 91301. (818) 707-1712. (Feb '89)

Authenticate and Mutate ‡‡‡‡

Authenticate and Mutate are HyperCard extensions that add valuable abilities for application programmers. Authenticate is an XFCN that lets you control the contents entered into all fields. It also lets users set the error response, which is great for database creators. Mutate, also an XFCN, formats text fields in ways that HyperCard can't begin to dream of. Authenticate, version 2.4; Mutate, version 1.0. Requires HyperCard or 4th Dimension. $125. SoftStream International, Inc., 19 White Chapel Dr., Mount Laurel, NJ 08054. (800) 262-6610 or (609) 866-1187. (June '90)

BMUG PD-ROM ‡‡‡‡

BMUG PD-ROM is a CD-ROM disc that contains 300 megabytes of shareware, public-domain software, and demoware. The categories include business, education, games, fonts, Mac II-specific products, and the like. Version II. Requires Mac Plus or later and a CD-ROM drive. $99.95. Discovery Systems, 7001 Discovery Blvd., Dublin, OH 43017. (614) 761-4133. (July '89)

ClubMac CD-ROM ‡‡‡½

ClubMac CD-ROM discs contain 430 to 500 megabytes of software, including DAs, sounds, editors, word-processing utilities, spreadsheet templates, and 80 megabytes of stacks. Has user rating system, classified-ad section, and electronic-bulletin-board support. Released quarterly. Fall '88 and Winter '89 reviewed. Single issue, $199; annually, $350. Quantum Access, 50 Briar Hollow W., Houston, TX 77027. (713) 622-3211. (July '89)

Course Builder ‡‡‡‡

Course Builder creates stand-alone educational applications. This easy-to-learn dedicated programming language uses blocks and arrows. Graphics, animation, and sound can be integrated. Version 2.0 allows

mathematical calculations. Bad documentation. Version 3.21. Black-and-white, $395; color, $695. TeleRobotics International, 7325 Oak Ridge Highway, Suite 104, Knoxville, TN 37921. (615) 690-5600. (Oct '87)

Dialoger ★★★★

Dialoger is a great HyperCard utility for programmers. It uses an easy-to-master palette-based interface that lets you build complex dialog boxes. Virtually all the power of the Mac's Dialog Manager is available. It can make a huge difference in the appearance and functionality of your stacks. Version 1.02. Requires Mac Plus or later. $94.29. theResult Software, 616D Guilford College Rd., Greensboro, NC 27409. (800) 365-5034 or (919) 294-5034. (Feb '90)

Educorp CD-ROM ★★

The Educorp CD-ROM contains approximately 300 megabytes of shareware, public-domain software, and demoware in 23 categories such as business education, music, and fonts; has an electronic bulletin-board system. Version 4.0. Requires HyperCard 1.2. $199. Educorp Computer Services, 7374 Trade St., San Diego, CA 92121. (619) 536-9999. (July '89)

Family Matters ★★★½

Family Matters is a set of HyperCard stacks that lets you catalog family and personal information. Has areas for historical information, current possessions, and data. Decent organization. The interface is pretty bare bones, and the printing abilities are inadequate. Version 1.0. Requires Mac Plus or later and HyperCard. $49.95. Spinnaker Software Corp., 201 Broadway, Cambridge, MA 02139. (800) 826-0706 or (617) 494-1200. (Jan '90)

Guide ★★★★

Guide is a true hypertext tool that allows the easy creation of complex associative documents. There are no screen-size limitations. A conversion utility lets Macintosh Guide documents run under Windows Guide. The program's performance is excellent, with some limitations. Version 2.0. Requires Macintosh Plus or later. $295. OWL International, 2800 156th Ave. S.E., Bellevue, WA 98007. (206) 747-3203 (Apr '90)

Hyper Toolkit ★★★★½

Hyper Toolkit is a large collection of HyperCard developmental tools and XCMDs that adds color, pop-up menus, fancy dialog boxes, and much more to your stacks. Serious HyperCard developers will want a copy. Lacks good documentation. Version 2.0. $99. Shared Intelligence, 1001 Bridgeway, Suite 279, Sausalito, CA 94965. (415) 331-2061. (Oct '90)

HyperAnimator ★★★★

HyperAnimator lets you create talking heads for HyperCard stacks using MacinTalk or digitized sound resources. Easy to implement, especially if you know HyperCard well. Version 1.5.2. Requires Mac Plus or later with 1 megabyte of RAM. $199.95. Bright Star Technology, Inc., 1450 114th Ave. S.E., Suite 200, Bellevue, WA 98004. (206) 451-3697. (Feb '89)

HyperAtlas ★★★

HyperAtlas is a collection of U.S. and world maps that are networked to stacks containing economic, political, and population data. Version 1.0. Requires HyperCard and a second disk drive or hard-disk drive. $99. MicroMaps Software, P.O. Box 757, Lambertville, NJ 08530. (800) 334-4291 or (609) 397-1611. (Oct '88)

HyperBASIC ★★★½

HyperBASIC is a stand-alone XCMD-compiler application. You must be able to program in BASIC to use it. Its BASIC is pretty standard and gives access to 352 Toolbox traps (not a lot). There's no debugging ability worth using, and the manual is poor. This is not a good system for HyperCard XCMD creation yet. Version 1.05. Requires Macintosh Plus or later and HyperCard. $99. Teknosys, 3923 Coconut Palm Dr., Suite 111, Tampa, FL 33619. (813) 620-3494. (May '90)

HyperCard ★★★★½

HyperCard 2.0 is a huge improvement over earlier versions. Graphics, text handling, and printing have been improved significantly. Multiple stacks can be opened at one time. Version 2.0. Requires Mac Plus or later and System 6.0.5; hard-disk drive and 2 megabytes of RAM recommended. Claris Corp., 5201 Patrick Henry Dr., Santa Clara, CA 95052. (800) 544-8554 or (408) 727-8227. (Dec '90) ★'87 Eddy

HyperDA ★★★★

HyperDA lets you browse through HyperCard stacks via a DA. A true equalizer for 512K users who cannot normally access stackware. Doesn't support global variables. Version 2.0. Requires Mac 512K or later. $129; upgrade, $29. Symmetry Software Corp., 8603 E. Royal Palm Rd., Suite 110, Scottsdale, AZ 85258. (800) 624-2485 or (602) 998-9106. (May '88)

HyperHIT ★★★½

HyperHIT is a set of HyperCard XFCNs and XCMDs that lets you build database applications in HyperCard. Has many powerful functions and tools. HyperTalk experience is required, and results are as slow as HyperCard. Version 1.0. Requires HyperCard. $195; site license, $100 each for five or more copies. SoftStream International, Inc., 19 White Chapel Dr., Mount Laurel, NJ 08054. (800) 262-6610 or (609) 866-1187. (Jan '90)

HyperSpeller ★★★★½

This spelling checker is the utility that HyperCard has been missing. It adds the much-needed feature of batch spell-checking and checks the contents of text fields on all cards or a subset of cards. Easy installation and excellent performance. HyperCard 2.0-compatible. Version 1.0. $49.95. Foundation Publishing, Inc., 14228 Shore Ln., Prior Lake, MN 55372. (612) 445-8860. (Oct '90)

HyperTMON ★★★½

HyperTMON is the first true HyperTalk debugger. This XCMD is good but needs some work. Although it's a decent debugger, it has trouble stepping through some HyperTalk code and has a few command incompatibilities that should be fixed. Version 1.0. Requires Mac Plus or later and HyperCard. $99.95. ICOM Simulations, Inc., 648 S. Wheeling Rd., Wheeling, IL 60090. (708) 520-4440. (Apr '90)

HyperTutor ★★★★½

HyperTutor is a stack that teaches HyperTalk, HyperCard's programming language. Uses an interactive Test Mac on each card to write scripts. A variety of windows makes it good for both beginners and advanced programmers. Version 1.12. Requires Mac Plus or later with 1 megabyte of RAM and HyperCard 1.1 or later; hard-disk drive recommended. $49.95. Power Up Software Corp., 2929 Campus Dr., San Mateo, CA 94403. (800) 851-2917 or (415) 345-5900. (Apr '88)

Macintosh Bible: STAX Edition! ★★★

Macintosh Bible: STAX Edition! is the HyperCard version of the first edition of *The Macintosh Bible*. Covers system software, applications, hardware, and consumer advice. Requires 1 megabyte, HyperCard, and two 800K disk drives; hard-disk drive recommended. $39.95. STAX! to the Mac, 8008 Shoal Creek Blvd., Austin, TX 78758. (512) 467-4550. (Mar '89)

MindLink ★★★½

MindLink is a HyperCard-based idea processor. It focuses on the first part of the brainstorming process, leading you through a structured procedure that "exercises" your mind. It asks questions that force you to focus on the problems being researched. Because HyperCard is not fast enough to keep up with your thoughts, it's frustrating. Version 2.0. Requires Mac Plus or later with 1 megabyte of RAM, HyperCard (included), two floppy-disk drives or a hard-disk drive. Student version, $79.95; professional version, $299. MindLink, Inc., P.O. Box 247, North Pomfret, VT 05053. (802) 457-2025. (May '90)

Nutrition 2.0 ★★★½

The Nutrition HyperCard stack is a good way to help you maintain a healthy diet. The nutritional database needs more information, but otherwise the stack is very useful. Version 2.09. Requires Mac Plus or later, HyperCard 1.2 or later, and a hard-disk drive. $79. Big Byte Software, 25 Blake St., Needham, MA 02192. (617) 444-3028. (Apr '90)

Nuts & HyperBolts ★★★½

Nuts & HyperBolts is a series of large HyperCard stacks that help you improve your grammar. You can work only with the mouse; there are no keyboard shortcuts — period. Version 2.0. Requires Mac Plus or later with 1 megabyte of RAM. Five-disk set, $189.95. Sterling Swift Software, P.O. Box 43325, Austin, TX 78745. (512) 280-2431. (Aug '90)

101 Scripts and Buttons for HyperCard ★★★½

101 Scripts and Buttons for HyperCard is a collection of scripts, buttons, fields, graphics, utilities, XCMDs, XFCNs, icons, cursors, and more for creating HyperCard stacks. Version 1.1. Requires 1 megabyte of RAM, HyperCard 1.0, and a hard-disk drive. $49.95. Individual Software, Inc., 125 Shoreway Rd., Suite 3000, San Carlos, CA 94070. (800) 331-3313 or (415) 595-8855. (June '89)

Reports ★★★½

Reports endows HyperCard stacks with the power to sort and impart information like a database does. Customizing reports is a difficult process. Version 2.0. Requires Macintosh Plus or later, System 6.0 or later, and HyperCard 2.0 (included). $149.95 plus shipping. Nine to Five Software, Inc., 3360 Mitchell Ln., Suite 105, Boulder, CO 80301. (800) 292-5925 or (303) 443-4104. (Aug '88)

Reunion ★★★★½

This is one of the nicest genealogy programs around. Supports GEDCOM. Includes space for digitized photos, an index, and a birthday file. A complex program that is complemented by

an excellent manual. Version 1.7. Requires System 6.04 or later and 1 megabyte of RAM. $149. Leister Productions, 14 Hill Blvd., Mechanicsburg, PA 17055. (717) 697-1378. (Oct '90)

Script Edit ⚡⚡⚡⚡

Script Edit lets users open multiple script windows simultaneously from different stacks. It makes stack creation easier and far more convenient than previously possible. Version 1.0. Requires Mac Plus or later. $79. Somak Software, 535 Encinitas Blvd., Suite 113, Encinitas, CA 92024. (800) 842-5020 or (619) 942-2556. (Feb '90)

scriptExpert ⚡⚡⚡⚡

scriptExpert helps you generate HyperTalk scripts by leading you through the correct use of the language. Select a common command, and dialog boxes prompt you for necessary components. Version 1.2. Requires HyperCard. $79.95. Hyperpress Publishing, P.O. Box 8243, Foster City, CA 94404. (415) 345-4620. (Oct '88)

STELLAStack ⚡⚡⚡⚡

STELLAStack lets you change the boxes and circles of a STELLA simulation into familiar images and icons with digitized sounds and animation. Contains the STELLA kernel for accessing STELLA models; lets you change models in real time. Version 2.0. Requires HyperCard 1.2.1 or later. Business, $295; academic, $175. High Performance Systems, Inc., 45 Lyme Rd., Hanover, NH 03755. (800) 332-1202 or (603) 643-9636. (July '89)

Time Table of Science and Innovation ⚡⚡⚡½

Time Table of Science and Innovation presents events from the history of technology on a HyperCard-based CD-ROM. Text, graphics, and sound are nicely integrated, and related events are well linked. Includes HyperCard on CD-ROM. Version 2.0. $185. Xiphias, 8758 Venice Blvd., Marina Del Rey, CA 90034. (213) 841-2790. (May '89)

VideoWorks II HyperCard Driver ⚡⚡⚡½

VideoWorks II HyperCard Driver lets you play movies directly from a stack. It's one way to add color animation to HyperCard. Version 1.2. Requires VideoWorks II and HyperCard; hard-disk drive recommended. $99.95. MacroMind, Inc., 410 Townsend St., Suite 408, San Francisco, CA 94107. (415) 442-0200. (Dec '88)

Wild Things ⚡⚡⚡⚡

Wild Things is a set of 40 XCMDs that teaches you about XCMDs. Comes on four disks; two are devoted to source code. Source code is provided in Pascal (MPW, TML, and Lightspeed), C (MPW and Lightspeed), and FORTRAN (MPW) for each of the XCMDs. Version 1.1.1. Requires Mac Plus or later, System 6.0.2 or later, HyperCard 1.2.1 (included), and a hard-disk drive. $150. Language Systems Corp., 441-B Carlisle Dr., Herndon, VA 22070. (703) 478-0181. (Dec '89)

XCAL ⚡⚡⚡½

XCAL adds calculation and spreadsheetlike abilities to stacks. Grids are restricted to the size of single cards. Extends HyperCard's math abilities significantly. Manual could be better. Requires 2 megabytes and HyperCard (included). $149.95. Trendware Corp., P.O. Box 2285, Huntington, CT 06484. (203) 926-1116. (Jan '90)

Multimedia

Business Simulator ⚡⚡⚡⚡

Business Simulator is a simulation-game training tool. You have to manage a company through several stages during 25 years and decisions become more difficult over time. Version 2.0. Requires Mac Plus or later. $69.95. Strategic Management Group, 3624 Market St., Philadelphia, PA 19104. (215) 387-4000. (Dec '87)

ColorSpace IIi/FX ⚡⚡⚡⚡

ColorSpace IIi/FX brings live 24-bit video to the Mac. The FX board converts regular TV signals so they can be displayed on the Mac. It also offers sophisticated special effects. Includes Digitizer DA to grab frames for export. The IIi lets you mix live video with computer graphics. Requires Mac II or later. IIi, $2,299; FX, $3,499. Mass Microsystems, 550 Del Rey Ave., Sunnyvale, CA 94086. (800) 522-7979 or (408) 522-1200. (Mar '90) ★ '88 Eddy

MacRecorder ⚡⚡⚡⚡½

MacRecorder is an audio digitizer for adding sounds to your Mac, animations, or HyperCard stacks. Supports an extensive array of audio-manipulation effects. HyperSound Toolkit makes adding sounds to HyperCard stacks easy. Version 2.0.3. Requires Mac Plus or later; HyperSound requires HyperCard version 1.2.1 or later. $249. Farallon Computing, Inc., 2000 Powell St., Suite 600, Emeryville, CA 94608. (415) 596-9000. (Jan '90)

MacroMind Accelerator ⚡⚡⚡⚡

The MacroMind Accelerator compiles MacroMind Director movies to make them run more smoothly. Compensates for the QuickDraw screen display. Version 2.0.1. Requires MacroMind Director. $195; upgrade from version 1.0, $50 plus shipping. MacroMind, Inc., 410 Townsend St., Suite 408, San Francisco, CA 94107. (415) 442-0200. (Dec '88)

MacroMind CD-ROM ⚡⚡⚡⚡

MacroMind CD-ROM's Clip Charts, Black and White Movies, and Clip Sounds are separate aids to help you construct movies and business presentations. Requires MacroMind Director. $49.95 to $59.95. MacroMind, Inc., 410 Townsend St., Suite 408, San Francisco, CA 94107. (415) 442-0200. (Aug '88)

MacroMind Director ⚡⚡⚡⚡⚡

MacroMind Director is the best tool for creating color and black-and-white presentations. Its object-oriented animation capabilities provide numerous editing features. Allows MIDI input. Version 2.0. Requires Mac Plus or later, System 6.0.2 or later, 1 megabyte of RAM (2 megabytes recommended), color requires 2 megabytes of RAM (4 to 8 megabytes recommended). $695; upgrade from version 1.0, $149 plus shipping; upgrade from VideoWorks II, $250 plus shipping. MacroMind, Inc., 410 Townsend St., Suite 408, San Francisco, CA 94107. (415) 442-0200. (Sept '89) ★ '89 Eddy

Magic Flute Audio Notes ⚡⚡⚡⚡

The Magic Flute Audio Notes makes an ambitious attempt to explain Mozart's last opera with informational HyperCard stacks on a CD-ROM disc. Although the opera is a complex masterpiece, Audio Notes does it justice. It has four options for real-time listening: the original German libretto, an English libretto, a synopsis of onstage action, and a running musicological commentary. A good value for CD-ROM-drive owners who are interested in learning more about this opera. $66. Warner New Media, 3500 W. Olive Ave., Suite 1050, Burbank, CA 91505. (818) 955-9999. (Nov '90)

MediaTracks ⚡⚡⚡⚡½

MediaTracks (formerly ScreenRecorder) is a utility for recording your on-screen Mac activities. Ideal for presentations and training. Uses a tape-recorder model. "Tapes" can include sounds recorded with applications such as MacRecorder and can be a fixed length or loop. Recordings can be installed into HyperCard stacks for easier distribution. Version 1.0. Requires Mac Plus or later. $295; as part of Multimedia Pack, $495; upgrade from ScreenRecorder to MediaTracks, $50; upgrade from ScreenRecorder to Multimedia Pack, $249. Farallon Computing, Inc., 2000 Powell St., Suite 600, Emeryville, CA 94608. (415) 596-9000. (June '89)

Plus ⚡⚡⚡

Plus extends the HyperCard model in two ways: by adding features and by providing platform portability. Plus is ahead of HyperCard in object graphics, specialized text fields, and color support, but with a slight performance cost. Most stacks run without modification on a Mac or on a PC running under Windows or OS/2. Run-time version available for the Mac. Windows 3.0 and OS/2 Presentation Manager versions to follow soon. Version 2.0. Requires System 6.01 or later and 2 megabytes of RAM. $495. Spinnaker Software Corp., 201 Broadway, Cambridge, MA 02139. (800) 826-0706 or (617) 494-1200. (Dec '90)

SuperCard ⚡⚡⚡⚡

SuperCard is an excellent HyperCard-like tool for developing animated presentations and other graphically rich applications. Its control over the interface and ability to produce stand-alone applications distinguish it from any dedicated animation or presentation program. The development environment has improved significantly. Version 1.5. Requires System 6.04 or later and 1 megabyte of RAM. $299. Silicon Beach Software, Inc., P.O. Box 261430, San Diego, CA 92129. (619) 695-6956. (Dec '90)

Voyager CD AudioStack ⚡⚡⚡⚡⚡

The Voyager CD AudioStack is a HyperCard tool kit for creating interactive CD-audio guides. The EventMaker is one of the main tools; once you've identified a particular audio passage, you can automatically create a button that places it in a stack. Requires Mac Plus or later, HyperCard or SuperCard, a hard-disk drive, a Mac-compatible CD-ROM drive, and speakers or headphones. $99.95. The Voyager Co., 1351 Pacific Coast Highway, Santa Monica, CA 90401. (213) 451-1383. (Nov '90)

Music

Alchemy ⚡⚡⚡⚡⚡

Alchemy loads and edits digitally sampled sounds from most commercial samplers. Version 2.23. Requires Mac Plus or later with 2 megabytes of RAM, MIDI or RS-422 interface, and sampler. $695. Passport Designs, Inc., 625 Miramontes St. #103, Half Moon Bay, CA

94019. (415) 726-0280. CP (Oct '88) ★'88 Eddy

Apple MIDI Interface ♪♪♪

The Apple MIDI Interface is a simple musical-instrument digital interface with a 1-megahertz clock rate. Has only one MIDI input and one output. Works with all Macs; adapter required for 128K and 512K. $99. Apple Computer, 20525 Mariani Ave., Cupertino, CA 95014. (408) 996-1010. (June '88)

Audiomedia ♪♪♪♪♪

Audiomedia turns the Mac into a self-contained, CD-quality digital-recording studio. You can play back, edit, and mix sound files and subject them to a variety of special audio effects. Uses 10 megabytes of disk space per minute of sound. Strong manual, with a chapter devoted solely to sound theory. Version 1.2. Requires Mac II and 2 megabytes of RAM. $995. Digidesign, 1360 Willow Rd., Suite 101, Menlo Park, CA 94025. (415) 688-0600. (Oct '90)

ConcertWare+ ♪♪♪♪

ConcertWare+ has different instruments and can use any four of a set of eight at any point in a piece. Supports Adobe's Sonata font. Version 4.06. Requires Mac 512K or later. $69.95. Great Wave Software, 5353 Scotts Valley Dr., Scotts Valley, CA 95066. (408) 438-1990. (Dec '87) ★'85 Eddy

Cue: The Film Music System ♪♪♪♪½

Cue: The Film Music System is a powerful and versatile assistant for scoring films. Automates spotting and logging cue points and searching for matching tempos. Also performs many minor jobs, such as generating a performing-rights cue sheet. Version 3.0. Requires Mac 512Ke or later. $595. Opcode Systems, Inc., 3641 Haven Dr., Suite A, Menlo Park, CA 94025. (415) 369-8131. CP (Feb '89)

Deluxe Music Construction Set ♪♪♪♪

Deluxe Music Construction Set lets you enter up to 48 voices on eight staves and play the music through the Mac's internal speaker and/or via MIDI. Version 2.5. Requires Mac Plus or later. $129.95. Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404. (800) 245-4525 or (415) 571-7171. CP (June '88)

Encore ♪♪♪♪½

Encore is quasi-rule-based music-notation program with a very nice interface. It supports multiple files and can deal with large scores. Version 1.31. Requires Mac Plus or later. $595. Passport Designs, Inc., 625 Miramontes St. #103, Half Moon Bay, CA 94019. (415) 726-0280. (May '90)

Finale ♪♪♪♪½

Finale is a complex, revolutionary music-notation program. It packs power and has a much-improved interface and manuals from earlier versions. Finale is best suited to users needing absolute control over all the music elements in large-scale compositional and/or publishing projects. Version 2.5. Requires Mac Plus, hard-disk drive, MIDI instrument and interface, and PostScript printer. $749. Coda Music Software, 1401 E. 79th St., Bloomington, MN 55425. (800) 843-2066 or (612) 854-1288. (May '90)

Galaxy ♪♪♪♪½

Galaxy is a universal patch librarian. You can audition and organize individual patches from a bundle or from separate patch banks. A good program that works well with Vision (Opcode's professional sequencing program). Version 1.0 reviewed, 1.0.2 MI shipping. $249. Opcode Systems, Inc., 3641 Haven Dr., Suite A, Menlo Park, CA 94025. (415) 369-8131. (Nov '90)

Harmony Grid ♪♪♪♪½

Harmony Grid offers an experiential approach to harmony theory. Users are presented with a grid, so they can see scales and chords as repeating patterns. They play these tones by moving the mouse over the grid, resulting in improvisation without requiring any training or technique. The program automatically provides counterpoint as well. Supports MIDI. Version 1.05. $99. Hip Software, 117 Harvard St., Suite 3, Cambridge, MA 02139. (617) 661-2447. (Aug '90)

Jam Session ♪♪♪♪

Jam Session is a music program for those who think MIDI refers to the length of skirts. Without any skill, you can "jam" with rock, jazz, rap, or country tunes. A sort of "Sing Along with Mitch" for the computer set. Version 1.1. Requires Mac 512K or later. $49.95. Brøderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903. (800) 521-6263 or (415) 492-3200. CP (July '88)

Master Tracks PRO 4 ♪♪♪♪½

Master Tracks PRO 4 is a full-featured second-generation MIDI sequencer that adheres to the Mac interface very well. It's the first program to have graphics-controller editing. Version 4.14. Requires Mac Plus or later. $495. Passport Designs, Inc., 625 Miramontes St. #103, Half Moon Bay, CA 94019. (415) 726-0280. (Dec '87)

MusicProse ♪♪♪♪

MusicProse, a subset of Finale 2.0, was designed specifically for preparing lead sheets, piano-vocal parts, and small ensemble scores. It's relatively easy to learn and is a very good performer. Version 1.0. Requires Mac Plus or later, a hard-disk drive, MIDI instrument and interface, and a printer. $399. Coda Music Software, 1401 E. 79th St., Bloomington, MN 55425. (800) 843-2066 or (612) 854-1288. (May '90)

NoteWriter II ♪♪♪♪

NoteWriter II is designed solely for musical notation. It is a completely non-rules-based program in which you must specify where the music should go on a page. Version 2.69. $495. Passport Designs, Inc., 625 Miramontes St. #103, Half Moon Bay, CA 94019. (415) 726-0280. (Aug '90)

Perceive ♪♪♪♪

Perceive is a multipart music-training package. Generally effective tools train the ear. Not all parts are equally good. Requires any Mac. $99. Coda Music Software, 1401 E. 79th St., Bloomington, MN 55425. (800) 843-2066 or (612) 854-1288. (Mar '90)

Performer ♪♪♪♪

Performer is a full-featured MIDI sequencer that includes looping, SMPTE synching, 32 simultaneous Ins and Outs, unlimited overdubbing, and compatibility with Professional Composer for transcription. Version 3.5. Requires Mac Plus or later with 2 megabytes of RAM, 2 floppy-disk drives, System 6.0.2 or later, and MIDI interface; hard-disk drive recommended. $495. Mark of the Unicorn, 222 Third St., Cambridge, MA 02142. (617) 576-2760. CP (Jan '88)

Practica Musica ♪♪♪♪♪

Practica Musica is a classic harmony course taught as a series of 11 activities that are presented as games. Topics include simple pitch reading and writing, scales, modes, interval recognition, chord spelling, and ear training. Supports MIDI. Version 2.2. Requires Mac Plus or later. $125. Ars Nova Software, P.O. Box 637, Kirkland, WA 98083. (800) 445-4866 or (206) 889-0927. (Aug '90)

Sound Designer II SK ♪♪♪♪

Sound Designer II SK set the standard for editing samples on lower-cost samplers, but it still lacks real-time high-fidelity playback. Version 2.0. Requires Mac 512K or later, sampler, and MIDI interface. Emax, E II, 2000/2002, DSS-1, S900, $395. Digidesign, 1360 Willow Rd., Suite 101, Menlo Park, CA 94025. (415) 327-8811. (Oct '88)

Super Librarian ♪♪♪½

Super Librarian is a multiplatform universal patch librarian for MIDI synthesizers that organizes different groups of instruments or different banks of a single instrument into a performance. The program supports file transfers to other computer platforms — a great feature if you need it, but it results in an interface that's less than optimal. Version 1.4. $249. Pixel Publishing, 641 Caledonia Rd., Toronto, Ontario M6E 4V8, Canada. (416) 785-3036. (Nov '90)

Turbosynth ♪♪♪♪♪

Turbosynth creates sounds for a digital sampler using modular-synthesis techniques. Good harmonic spectral inverter. Lacks an easy method of multisampling. Version 2.0. Requires Mac Plus or later, sampler, and MIDI interface. $349. Digidesign, 1360 Willow Rd., Suite 101, Menlo Park, CA 94025. (415) 327-8811. (Oct '88)

UpBeat ♪♪♪½

UpBeat turns the Mac into a front panel for a highly complex and versatile drum machine. Input patterns with mouse, MIDI keyboard, or drum machine. Version 2.05. Requires Mac 512K or later with 1 megabyte of RAM, MIDI interface, and MIDI synthesizer. $199. Dr. T's Music Software, Inc., 100 Crescent Rd., Suite 1B, Needham, MA 02194. (617) 455-1454. (May '88)

Vision ♪♪♪♪½

Vision sets a new standard in Mac sequencers. Supports full SMPTE control, event-list and graphics editing; real-time and step recording; looping; tempo, meter, and dynamic changes; and standard MIDI files. MIDI Keys maps certain Mac keyboard commands to your MIDI controller. Faders window supports 32 faders offering real-time control of volume, tempo, and synthesizer-specific functions. Version 1.2. Requires Mac Plus or later, MIDI interface, and MIDI synthesizer. $495; EZ Vision, $149. Opcode Systems, Inc., 3641 Haven Dr., Suite A, Menlo Park, CA 94025. (415) 369-8131. CP (Dec '89)

VIDEO

ColorBoard 264 ♪♪♪♪½

ColorBoard 264 is a relatively low-cost video board that has 32-bit capability and good performance. One of the cheapest ways to get 16.7 million colors on your Mac. Requires Mac II series or SE/30 and System 6.0.3 or later. NuBus version, $745; SE/30 version, $895. RasterOps Corp., 2500 Walsh Ave., Santa Clara, CA 95051. (800) 468-7600 or (408) 562-4200. (Feb '90)



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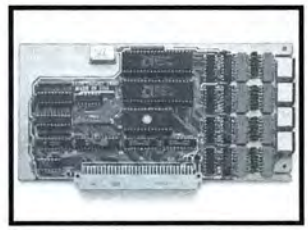
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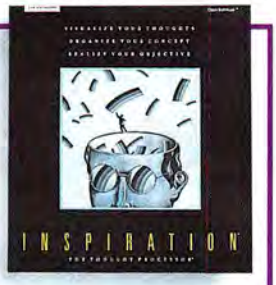
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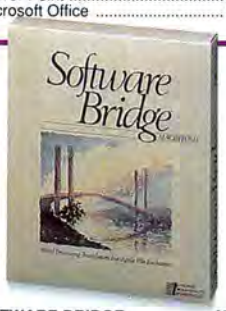
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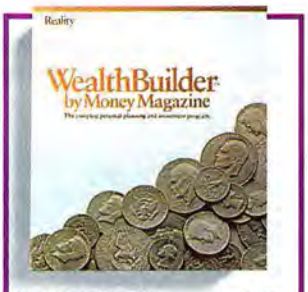
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- ☐ a) Mac Plus
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- ☐ r) Word Processors
- ☐ s) Database Managers
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HARDWARE
- ☐ w) Mainframe
- ☐ x) Mini
- ☐ y) PC
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- ☐ 1) Monitors
- ☐ 2) Disk/Tape Back-up
- ☐ 3) Add-in Boards
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5. Are you involved in the purchasing of microcomputer equipment at your company?

- ☐ 5) Yes
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6. If so, what function do you serve in the buying process?

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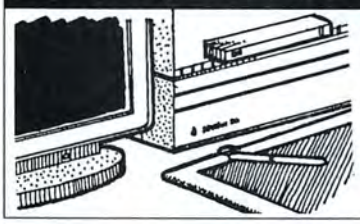
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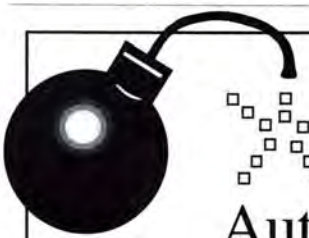
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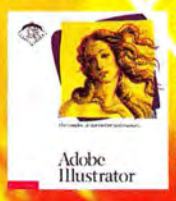
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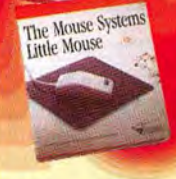
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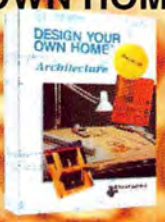
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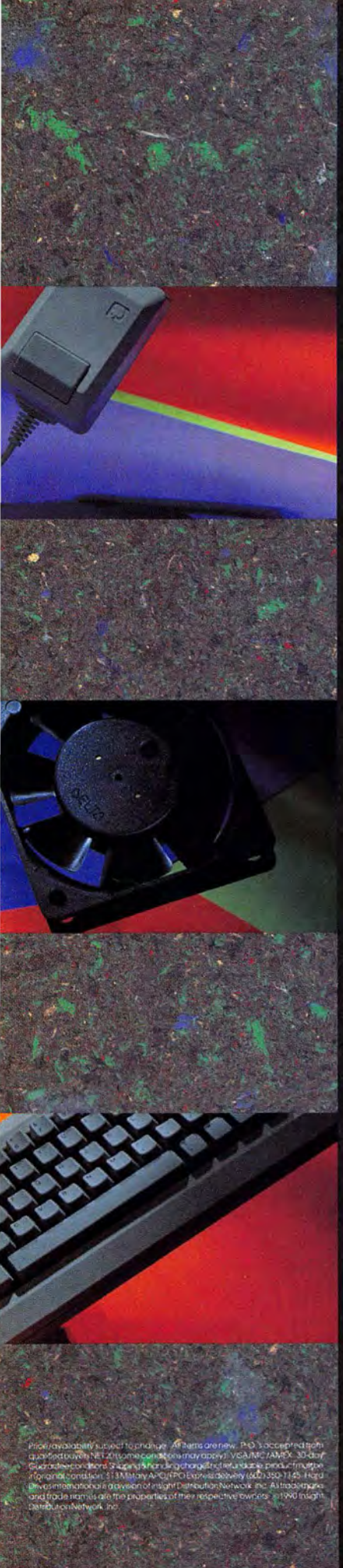
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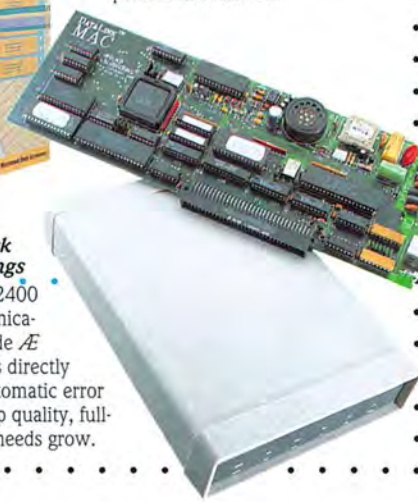
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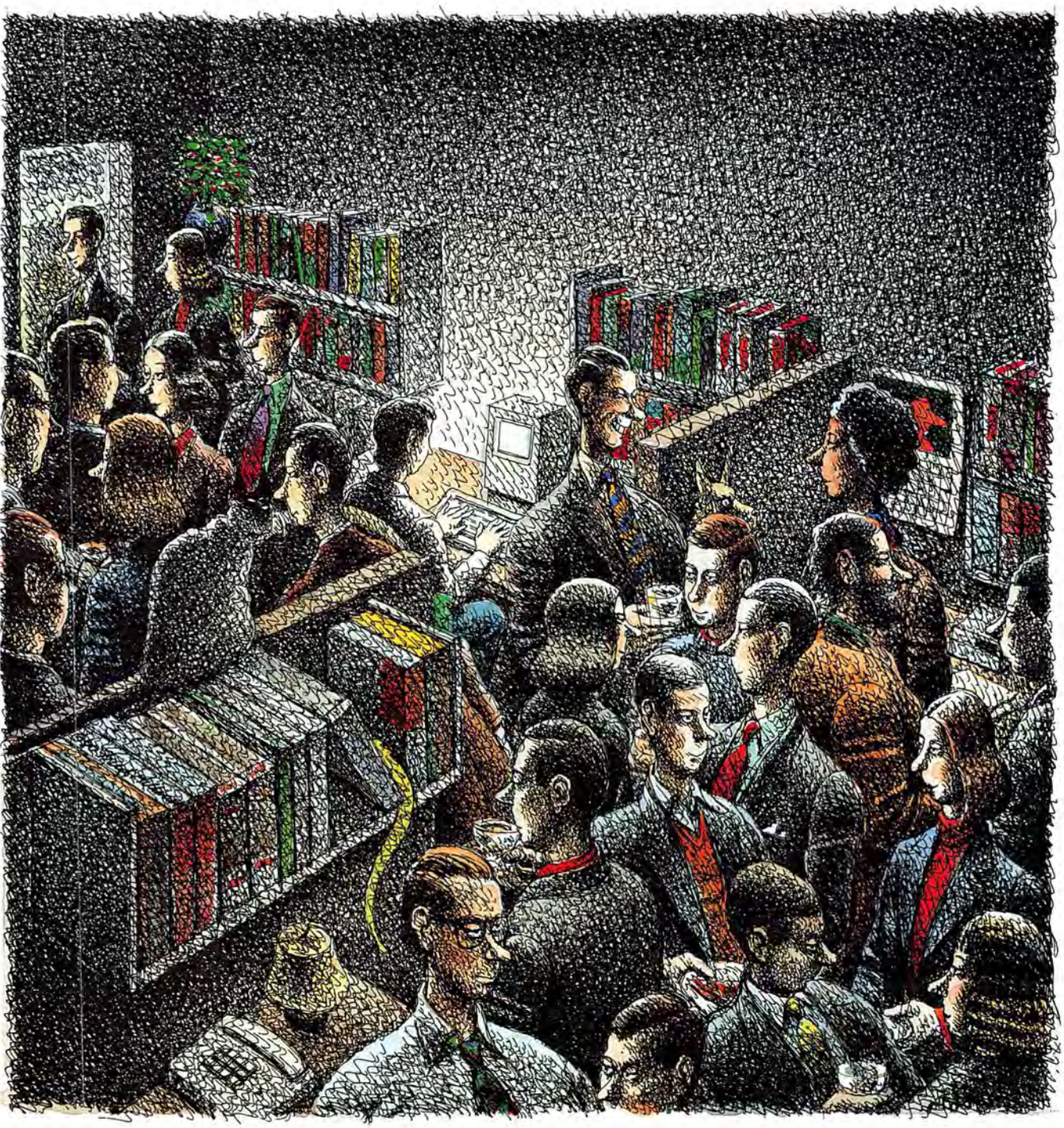
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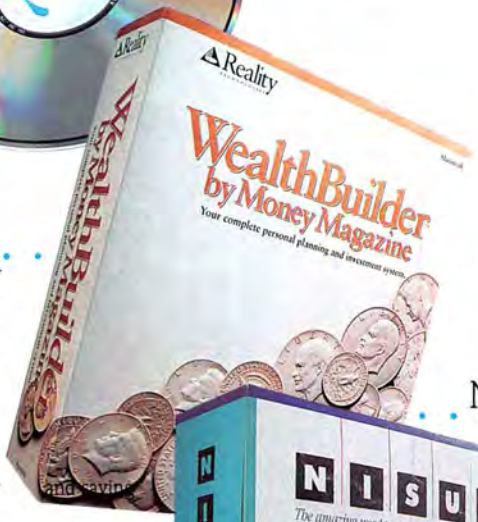
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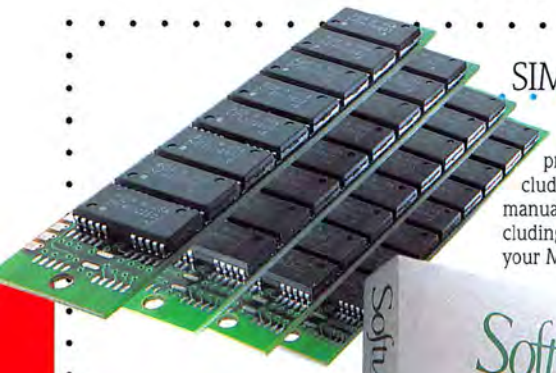
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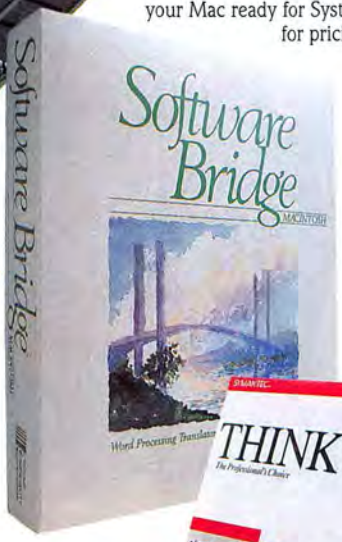
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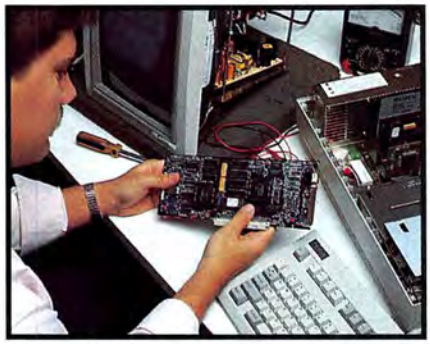




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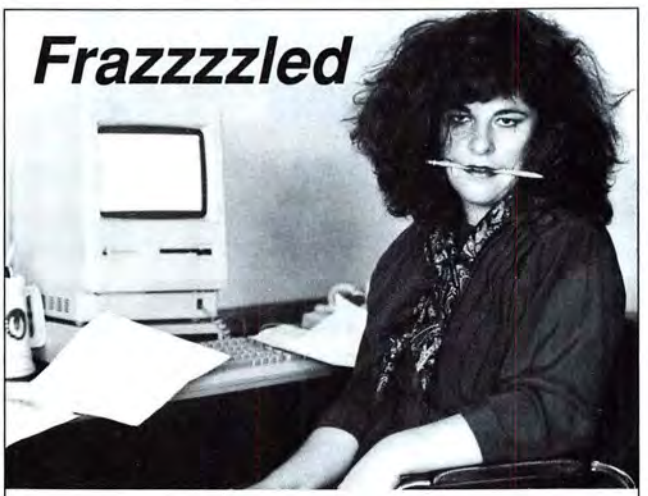
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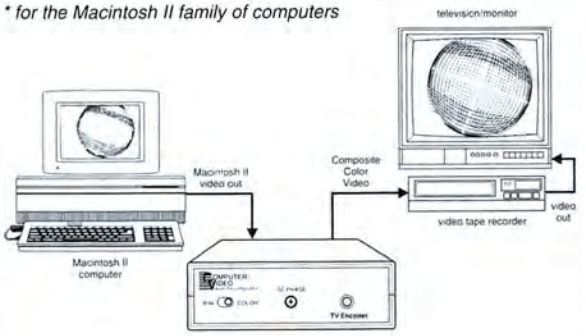
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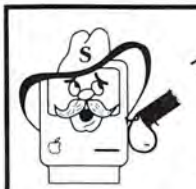
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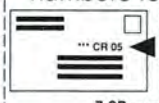
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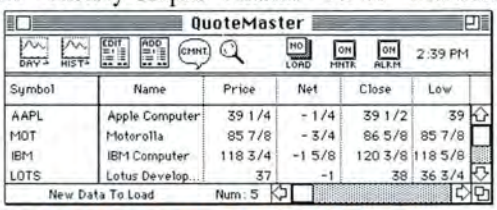
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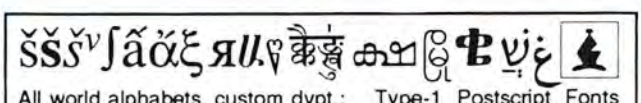
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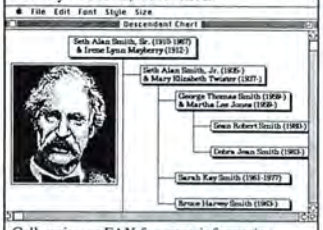
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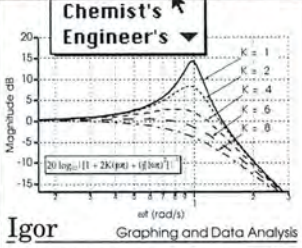
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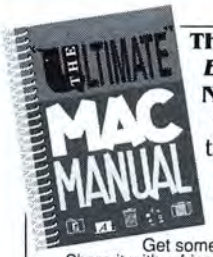
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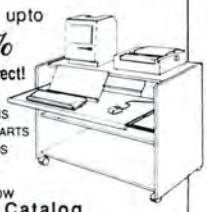
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Apple Events



Apple's idea of multimedia product intros: screaming executives, historical figures in electric carts, a sea of madly clapping shills, and more — much more.



If there was ever a strange event, it was the Apple rollout of the Mac LC, the Mac IIsi, and the Classic Mac. Apple wanted the world to see its new machines and loaded the audience with so many shills that the Fremont, California, fire marshal turned away hundreds of those who were actually invited. These turned-away masses wound up watching the show on TV in one of the surrounding Apple computer factories.

Apple pulled out all the stops. Outside the event were caterers galore, apparently hired for some big company party. Even Wozniak was there in a cameo role (driving one of those electric carts used on factory floors to transport the boss around).

Anyway, the dog and pony show went on for over an hour and a half. It was mostly videotapes (with a couple of live hookups to places such as Singapore and Germany). Everyone oooh'd and ahhh'd over the new machines. They complained that the PC was too hard to use, yak, yak, yak.

The audience in the big hall clapped madly, like the audience of cheering animals in some of those old Betty Boop cartoons. By the end of the show, they were all whooping it up on every other word. It was worse than a Steve Jobs Show, by far.

I figured, by the way the audience of shills was clapping and whistling, that the entire production was designed by the schlockmeister who produces the "Amazing Discoveries" infotisement scambola shows, where some guy with an Australian accent uses a miracle polish or an unknown chef magically beats skim milk into whipped cream. The audience goes wild on cue. All that was missing from the Apple production was a toll-free number to call to order yours now.

Worse than the audience were some of the Apple spokespersons. The most distracting was Carol Ebert, who heads manufacturing or something. The way she screamed her memorized spiel made it hard to pay attention to what she was saying. Obviously she'd taken a seminar on public speaking — nobody opens her mouth that wide naturally. It was unbelievable. When Ted Barnett, another spokesman, had his turn, he sounded as if he was introducing the bird call he was about to do on the Carson show. Who teaches this speaking style anyway?

Maybe the worst one of all was Michael Spindler, who sounded like Commandant Klink on "Hogan's Heroes":

"You vill buy a Mac! Verstehen Sie?" Can't Apple find any American-born executives to do these jobs? My advice: Keep this guy off the podium or make him lose the accent.

When I wasn't aghast at the Apple employees or annoyed by the audience, I was stunned by the fawning folks out in never-never land who had been given free Macintoshes to play with for the past few months. Most of the show consisted of these hopeless testimonials.

Apparently, Apple had loaded up a few companies around the country with machines. On top of that, Apple outfitted the entire podunk burg of Jacksonville, Oregon, with various new machines so they could record these folks' reaction on videotape. One woman was crying over the machines. Another guy was talking about how his Mac was part of his family. Someone said he was in love with the Mac — literally. Obviously these people don't get out a lot. It was pathetic.

After the show came the press conference. Up front to answer questions were Sculley and — for some unknown reason — Ed Anderson, prexy of Computerland; Richard Grady of Liberty Mutual Insurance; and Heidi Roizen of T/Maker. It was weird: They ducked all the questions, and the insurance man went on and on boring everyone stiff with some sort of discussion about annuity sales or God-knows-what. This press event is now on my Top 10 all-time list of time wasters.

After the press conference ended, everyone was invited to tour the plant. The line was outrageous. Disneyland's Matterhorn ride line is shorter — and the Matterhorn line moves along. This one didn't, so I skipped the tour. I mean, who wants to wait in line to see a factory? Anyway, it's not a real factory unless you have to wear a hard hat.

But it appeared to others that the long event was a big success, and Apple proved it could still draw a crowd. Apple also avoided having the waving and dancing nerds come out at the end of the show — something Microsoft did with its Windows rollout. Seeing dancing nerds stumbling all over the stage makes me itch.

The big question remains: Will the new machines combined with Apple's more aggressive approach keep Apple on a steady growth path? I sure hope so. Otherwise, in a few years, I won't have anything to complain about.



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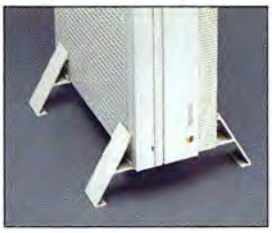
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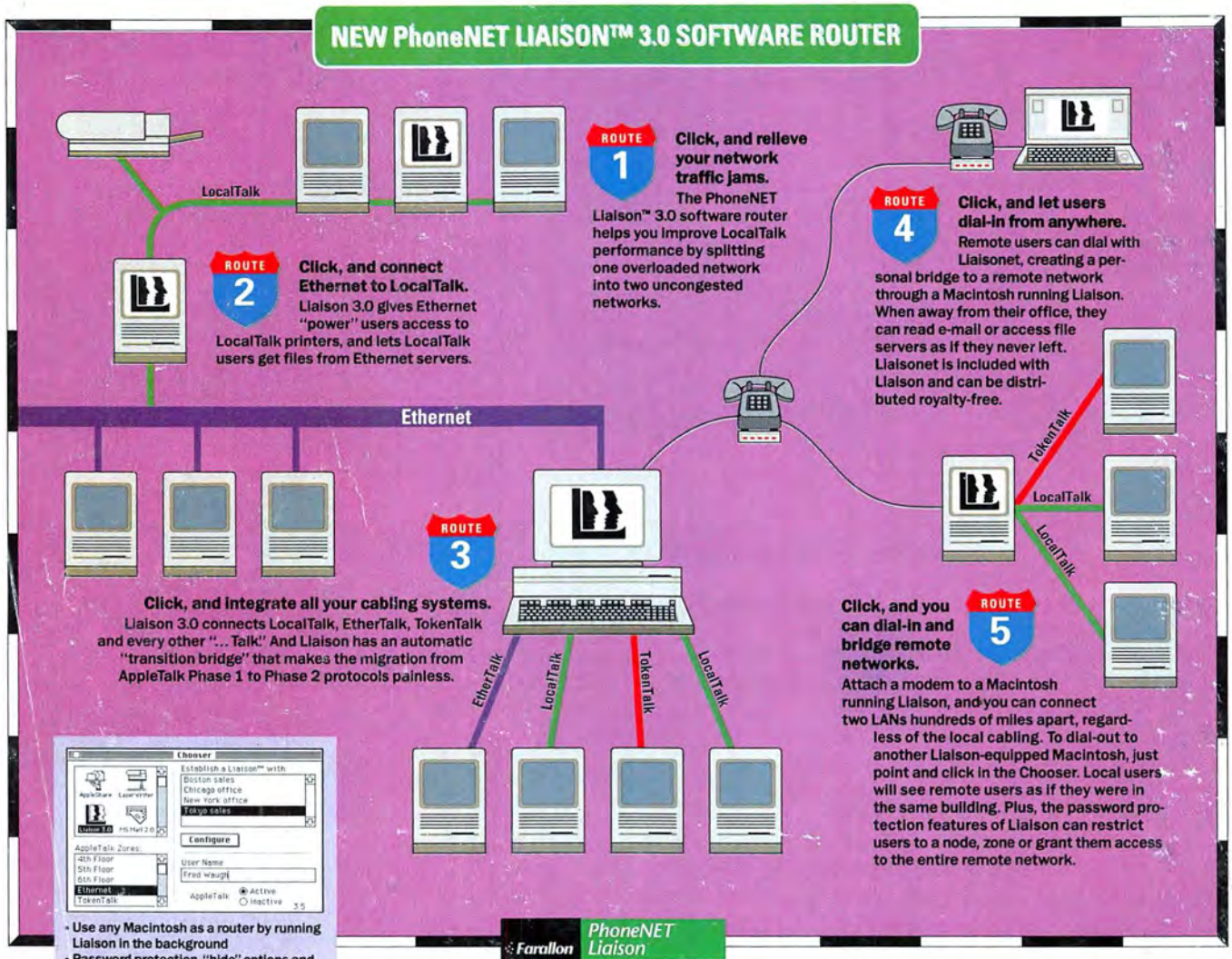
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